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HEARING
ON
NATIONAL DEFENSE AUTHORIZATION ACT
FOR FISCAL YEAR 2022
AND
OVERSIGHT OF PREVIOUSLY AUTHORIZED
PROGRAMS
BEFORE THE
COMMITTEE ON ARMED SERVICES
HOUSE OF REPRESENTATIVES
ONE HUNDRED SEVENTEENTH CONGRESS
FIRST SESSION
SUBCOMMITTEE ON STRATEGIC FORCES HEARING
ON
**FISCAL YEAR 2022 BUDGET REQUEST
FOR MISSILE DEFENSE AND
MISSILE DEFEAT PROGRAMS**

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FISCAL YEAR 2022 BUDGET REQUEST FOR MISSILE DEFENSE AND MISSILE DEFEAT PROGRAMS

HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
SUBCOMMITTEE ON STRATEGIC FORCES,
Washington, DC, Tuesday, June 15, 2021.

The subcommittee met, pursuant to call, at 3:03 p.m., in room 2118, Rayburn House Office Building, Hon. Jim Cooper (chairman of the subcommittee) presiding.

OPENING STATEMENT OF HON. JIM COOPER, A REPRESENTATIVE FROM TENNESSEE, CHAIRMAN, SUBCOMMITTEE ON STRATEGIC FORCES

Mr. COOPER. Good afternoon. The subcommittee will come to order.

The purpose of today's hearing is to receive testimony on the 2022 budget request for missile defense programs.

First, I would like to ask unanimous consent that nonsubcommittee members be allowed to participate in today's hearing after all subcommittee members have had an opportunity to ask questions.

Is there objection?

Then, without objection, nonsubcommittee members will be recognized for the appropriate time for 5 minutes.

I would also like to ask my colleagues—this is not a unanimous consent request—that we try to keep our public comments as brief as possible so that we will have a maximum amount of opportunity for the closed session, which will follow this one. Ideally, we will start that one at 4 o'clock, if not earlier, because the more time we have in that session the better.

Today's distinguished witnesses are Ms. Leonor Tomero, well known to this subcommittee, who is now Deputy Assistant Secretary of Defense for Nuclear and Missile Defense Policy; General VanHerck, Commander of the United States Northern Command and North American Aerospace Defense Command; Vice Admiral Hill, Director of the Missile Defense Agency; Lieutenant General Karbler, Commander of the United States Army Space and Missile Defense Command; and Lieutenant General John Shaw, Deputy Commander of the United States Space Command.

We have a breadth of experience with this panel, and I thank you for participating.

In fiscal year 2022 budget request, this administration continued efforts across the missile defense enterprise to improve our U.S. missile defense capabilities. The administration has properly funded the Hypersonic and Ballistic Missile Tracking Space Sensor, a top priority for our INDOPACOM [United States Indo-Pacific Com-

mand], STRATCOM [United States Strategic Command], and NORTHCOM [United States Northern Command] commanders.

I am concerned regarding the omission of the Homeland Defense Radar–Hawaii because we must ensure that the entire United States gets maximum advance warning against threats from rogue nations like North Korea. I am optimistic that the Pentagon and Missile Defense Agency are addressing issues which had led to the cancellation of the RKV [Redesigned Kill Vehicle] program as they pursue the Next Generation Interceptor.

Lastly, I look forward to hearing from both Lieutenant General Karbler and Lieutenant General Shaw on how Space Command is affecting our missile defense requirements.

I now turn to my ranking member, Mr. Turner, for his remarks.

[The prepared statement of Mr. Cooper can be found in the Appendix on page 37.]

STATEMENT OF HON. MICHAEL R. TURNER, A REPRESENTATIVE FROM OHIO, RANKING MEMBER, SUBCOMMITTEE ON STRATEGIC FORCES

Mr. TURNER. Thank you, Mr. Chairman. Thank you for all of our witnesses being here.

This has certainly been an especially challenging year, even with COVID [coronavirus] and high deployment rates for our warfighters. We appreciate everything you have done to support our men and women in uniform.

I am going to begin with just a brief comment on the Biden’s fiscal year budget. I am very concerned in where it has placed us in that it is so late, having received it in June. It inevitably means that we are going to be operating in a continuing resolution. I would like you in your comments to please address how that might affect the importance of your operations. I think missile defense, research and development, and certainly our nuclear modernization are areas that are most particularly impacted by continuing resolutions.

I continue to point out that the fiscal year is congressionally mandated. We have the ability to move the fiscal year. I would hope that Congress might take this up and we could look to move the fiscal year to the calendar year. We would save the Department of Defense 3 months every year of waste and shutdown in important programs.

And, of course, as I expressed before, I am disappointed in the top line in the President’s budget number.

The missile defense budget is just one example of where the Biden defense budget comes up short. The Biden missile defense request is \$8.9 billion, down from the \$10.5 billion enacted last year, and is the lowest since 2016. Key programs are underfunded, such as missile defense for Guam, funding for the Homeland Defense Radar–Hawaii, the elevated radar for cruise missile defense of the homeland, and the proliferated low Earth orbit Arctic communications program. There are key budget priorities that should have been included in the fiscal year 2022 Presidential request. In my opinion, we must protect the homeland with the next generation of missile defense technology.

One of the things that I am struck by in reviewing the written testimony of our witnesses is the key partnerships that we build with our allies through missile defense. We have Aegis Ashore in Romania, and the Polish site is 90 percent complete. We also have partnerships with Japan and South Korea, two other great partners that live day in and day out with the threat posed by North Korea.

Turning to the Middle East, just this past month, we saw our partnership with Israel pay dividends with the Iron Dome program. It is now clear that we must replenish the Iron Dome system and help advance next-generation missile defense technology developed by the United States and Israel.

I always like to point out that, prior to the deployment of Iron Dome, the critics of missile defense used to say that it is too expensive, it is escalatory, and that it won't work. And what we have seen from Israel is that not only is it cost effective in the amount of damage that is avoided, it works, and it is actually deescalatory because it gave Israel the ability to weigh what its options and its responses are. I hope that we look to our own missile defense doctrine as we look to our missile defense review to understand how those proven concepts should affect U.S. policy.

I want to thank the chairman again for holding this hearing, and I look forward to your presentations.

Mr. COOPER. I thank the gentleman.

We will now ask each of our witnesses to make their statements, which hopefully will be fewer than 5 minutes in length. Your written testimony will, of course, without objection, be entered into the record in its entirety.

And by the way, I think this hearing may hold the record for the number of acronyms used in the testimony. So I congratulate all the witnesses for that. It might be an Olympic record.

So the first witness will be Ms. Tomero.

STATEMENT OF LEONOR TOMERO, DEPUTY ASSISTANT SECRETARY OF DEFENSE FOR NUCLEAR AND MISSILE DEFENSE POLICY, U.S. DEPARTMENT OF DEFENSE

Ms. TOMERO. Thank you, Mr. Chairman.

Chairman Cooper, Ranking Member Turner, and distinguished members of the subcommittee, thank you for the opportunity to testify today before you in my previous home to speak about missile defense threat and the Department's missile policy—

Mr. COOPER. Could you pull the microphone a little—

Ms. TOMERO. Sure.

Mr. COOPER [continuing]. Closer? Thank you.

Ms. TOMERO. Sure. [continuing] And the Department's missile defense policy and priorities.

It is an honor to—it is an honor to testify today with General VanHerck, Vice Admiral Hill, Lieutenant General Shaw, and Lieutenant General Karbler.

Along with left-of-launch capabilities and our nuclear and conventional forces, missile defense plays a key role in U.S. defense. As missile technology matures and proliferates, the threat to the U.S. homeland, our allies and partners, and our deployed forces is increasing.

The Democratic People's Republic of Korea, DPRK, continues development and deployment of more capable intercontinental ballistic missiles that have destabilized and reshaped the security environment in East Asia. Iran's short- and medium-range ballistic missiles comprise the largest missile force in the Middle East. Additionally, Russia and China continue to develop and field increasingly advanced and diverse regional offensive missile capabilities as part of their anti-access [area] denial strategy intended to deny the United States freedom of action to [project] military power and to protect our allies and partners.

To adjust these evolving challenges, the Department will review its missile defense policies, strategies, and capabilities to ensure that we have effective missile defenses. The review will nest within the National Defense Strategy and contribute to the Department's approach on integrated deterrence. We expect to complete this strategy in January of 2022.

The Department is committed to defending the United States against rogue states' missile threats. The Department recently initiated development of the Next Generation Interceptor. The NGI will increase the reliability and capability of missile defense of the United States. As this program moves forward, it will align with the administration's defense goals and priorities.

With regard to regional missile defense, defenses will also remain central to maintaining the U.S. enduring advantage to flow forces into a militarily contested regional environment and to safeguard those forces should a conflict arise.

Additionally, the Department will continue to ensure that we bring a more integrated approach to air and missile defense, to address various types of ballistic missile threats and enable defense against cruise missiles and unmanned aerial systems. IAMD [integrated air and missile defense] will field interoperable and integrated missile defense sensors, interceptors, and command and control to improve capability against a range of threats.

With regard to enabling capabilities, in addition to improving today's operational systems, we are examining new enabling technologies. Secretary Austin has noted the importance of enhancing our global network of integrated sensors. Space-based and land-based sensors enable a variety of capabilities, such as detection, tracking, and targeting through all phases of flight for incoming missiles. U.S. commercial innovation is already transforming this field.

In fiscal year 2022, we will continue to develop the prototype Hypersonic and Ballistic Tracking Space Sensor that will allow the tracking of hypersonic threats and add resiliency to our sensor architecture. The Department's approach for regional hypersonic defense will first focus on defense in the terminal phase.

Information superiority is critical to the future battlefield and necessary to enable rapid planning and employment in a joint operating environment. To that end, the Department is developing multi-cyber-hardened, advanced all-domain awareness for our command and control architectures that will enable timely and accurate decision-making to address emerging threats. And we will continue to develop capabilities for left-of-launch and missile defeat

that will play an important role in effectively countering limited missile defense—missile attacks. Sorry.

Engaging and working with our allies and partners to enhance our collective missile defense efforts is a core focus area of the Department. Cooperative missile defense with strong allies, including Japan, the Republic of Korea, Australia, and our NATO [North Atlantic Treaty Organization] allies, will continue to be a strong priority. In the Middle East, U.S.-Israeli missile defense collaboration demonstrates the mutual benefits of technology sharing with our allies and partners. And we continue our efforts to strengthen missile defense cooperation with key Gulf Cooperation Council countries.

In this context, my office leads a series of dialogues to discuss modernization efforts and seek new opportunities for joint research, training, coproduction, and co-development.

In conclusion, as the Department prepares for its strategic review, I assure members of this committee that we are steadfastly committed to key missile defense missions, priorities, and capabilities, including working with our allies and partners to meet the challenge of growing missile threats in a cost-effective manner that strengthens regional and strategic stability.

I look forward to your questions. Thank you.

[The prepared statement of Ms. Tomero can be found in the Appendix on page 38.]

Mr. COOPER. Thank you.

General VanHerck.

**STATEMENT OF GEN GLEN D. VANHERCK, USAF, COMMANDER,
UNITED STATES NORTHERN COMMAND AND NORTH AMERICAN AEROSPACE DEFENSE COMMAND**

General VANHERCK. Chairman Cooper, Ranking Member Turner, and distinguished members of the subcommittee, it is a privilege to be here in front of you again to testify. I am honored to serve as the commander of the United States Northern Command and the North American Aerospace Defense Command, and I am grateful to appear alongside my colleagues as they are crucial partners in the defense of our homeland.

United States Northern Command and NORAD are separate commands, yet we work seamlessly to accomplish the critical mission of defending North America against all threats, whether posed by our competitors, natural disasters, or a pandemic.

We are in an era of renewed strategic competition, and this time we are facing two nuclear-armed near-peer competitors, both focused on circumventing our homeland defenses. Additionally, North Korea's recent unveiling of a new intercontinental ballistic missile capable of threatening Alaska, Hawaii, and the contiguous United States is meant to constrain our options in a crisis.

I remain concerned about my ability to defend the homeland as our competitors continue to develop capabilities to hold our homeland at risk from all vectors and in all domains, kinetically and nonkinetically, and to exploit a perceived gap between our nuclear deterrent, which I believe is the foundation of homeland defense, and our conventional homeland defense capabilities.

To close this perceived gap, we must accelerate efforts to transform our culture to think and operate globally and across all domains, and factor homeland defense into every strategy, plan, force management, force design, acquisition, and budgetary decision. United States Northern Command and NORAD are aggressively pursuing a left-of-launch framework to provide the President of the United States and the Secretary of Defense decision space and deterrence in strategic competition by focusing on endgame defeat in conflict.

With the Missile Defense Agency leading the effort, progress on the Next Generation Interceptor is on the right trajectory, but further delays will be detrimental to our defense and “deterrence by denial” capability. We must also capitalize on globally layered, multithreat detection systems such as over-the-horizon radar and Hypersonic and Ballistic Missile Tracking Space Sensors to adequately address both the capability and capacity of emerging threats.

The additional capabilities United States Northern Command is pioneering, as demonstrated by our latest global information dominance experiment, are focused on prying data from existing stovepipe networks to enable global and all-domain awareness. By ingesting data into a cloud-based architecture where the power of artificial intelligence and machine learning is unleashed, we can drastically reduce processing times across the globe to rapidly enable information dominance and decision superiority. All 11 combatant commanders endorse fielding these capabilities as soon as possible.

For United States Northern Command and NORAD, if we do not possess global all-domain awareness sensors and the network’s data standards and infrastructure to share information quickly and efficiently, our ability to defend the homeland against emerging threats—such as improved ballistic missiles; hypersonics; long-range, low radar cross-section cruise missiles—will slowly degrade.

The United States Northern Command and NORAD take solemn pride in executing the Secretary of Defense’s top priority by standing watch to defend our Nation. I am grateful for the trust and responsibility you place in United States Northern Command and NORAD.

Thank you, and I look forward to answering your questions.

[The prepared statement of General VanHerck can be found in the Appendix on page 48.]

Mr. COOPER. Thank you, General.

Now, Vice Admiral Hill.

STATEMENT OF VADM JON A. HILL, USN, DIRECTOR, MISSILE DEFENSE AGENCY

Admiral HILL. Chairman Cooper, Ranking Member Turner, and distinguished members of the subcommittee, thank you for your time today.

For PB-22 [President’s budget for fiscal year 2022], MDA [Missile Defense Agency] is requesting \$8.9 billion to develop and deploy homeland defenses against the rogue state threat and to improve our regional defenses against existing and emerging threats.

The evolving threat can be summarized as a less predictable ballistic threat with decoys and multiple warheads potentially with nuclear payloads. Hypersonic and cruise missile threats present high-speed and global maneuvering challenges to our sensor, command and control, and weapons architecture. Now, despite the pandemic restrictions, we have maintained momentum by advancing the program on several fronts this year, so I will go through a few of those.

I will start with C2BMC, Command and Control, Battle Management and Communications. We continued our spiral upgrades to integrate sensors and weapons across the joint force, supporting our combatant commands and services with tracking, cueing, and discrimination data. The hardened network integrates with JADC2 [Joint All-Domain Command and Control].

From a space global capability perspective to improve detection, tracking, cueing, and discrimination, Hypersonic and Ballistic Tracking Space Sensor, or HBTSS, that development continues under two competitive awards focused on an on-orbit demo in fiscal year 2023 for tracking dim boosting ballistic missiles and hyper glides. And this is a critical part of the hypersonic defense architecture.

Space-based Kill Assessment, or SKA, that is deployed today, full-up constellation, has participated in several flight tests, and we are on track to deliver operational hit assessment for the homeland in 2023.

Moving up to Alaska to the Long Range Discrimination Radar, despite the pandemic, we have delivered both arrays. The light-off is underway now, which means we are radiating, in coordination with the FAA [Federal Aviation Administration], to make sure that we take care of the local bush pilots. We will go to government acceptance this year, which is initial fielding in fiscal year 2022. Our focus will be integration into the Ground-based Midcourse Defense system, and then we will transfer to the lead service of the Air Force for Space Force operations in fiscal year 2023.

From a homeland perspective, continuing the GBI [Ground-Based Interceptor] fleet reliability efforts through the service life extension program has been going very well. And what that means for us is we can harvest aged hardware from the silos for our Stockpile Reliability Program. We now have hardware-based analytical background to our reliability estimates, while expanding the missile field capacity in Missile Field 4. I am very proud of the soldiers of the 100th Missile Defense Brigade and the 49th Missile Defense Battalion.

The next test for the GMD [Ground-Based Midcourse Defense] system is Boost Vehicle 203, BVT-03, developing capability to use our 3- and 2-stage GBI. What we will do is we will fly, instead of the full kinematic burn, we will burn only to the second stage so that we can increase our battlespace and enhance the timelines. That is on track for later this year.

NGI development was mentioned. We are underway with two competitive contracts focused on round emplacement earlier than the 2028 government estimate.

I am going to switch over to one of our regional systems, the Aegis Integrated Air and Missile Defense. We continue our deliv-

eries of the SM-3 [Standard Missile 3] Block IB missiles, the workhorse of the fleet, through a multiyear procurement. SM-3 Block IIA missiles, developed in cooperation with Japan, we are now in production. And we continue our close coordination with the Navy to leverage the SM-6 missile for sea-based terminal, which I will talk about in just a second.

I want to say a little bit about FTM-44, Flight Test Maritime-44, that we conducted last November, based on congressional direction to complete that test in 2020. We successfully intercepted a simple rogue state ICBM [intercontinental ballistic missile] with the mighty ship, USS *John Finn*, a new-construction IAMD [integrated air and missile defense] destroyer, with the SM-3 Block IIA missile. We leveraged the design robustness within Aegis and within SM-3, and what I mean by that is we are outside the requirement space and we are successful in that mission in a defense of Hawaii scenario.

Back to the pandemic that affected nearly every construction project we had, to include the Aegis Ashore in Poland. But the great news today that I did not report last year is we have all four SPY [radar] arrays now in place in the site. We have the fire control system in place, and this is a forcing function to get us to install and check out the Aegis weapon system which we removed from storage. We did all the digital signal checks on it. We are doing hardware upgrades, and that site is on path to complete construction in coordination with the Army Corps.

Aegis Sea-Based Terminal Increment 2 is deployed today, and it represents the first regional hypersonic missile defense capability. Increment 3 is underway and delivers in fiscal year 2024.

Now, based on real-world data collection and leveraging the proven Aegis engage-on-remote capabilities, PB-22 accelerates our hypersonic missile defense glide phase interceptor which allows us to intercept prior to terminal. We are evaluating industry proposals now, and we are going to make sure that that design is extensible to land-based batteries.

Shifting over to THAAD, Terminal High Altitude Area Defense, we continued our interceptor procurement, our production and training support, developing capabilities to address the evolving threat in very close coordination with the Army. We will go to the last of the Patriot integration testing this year.

Now, for defense of Guam, in PB-22 it includes funding for the initial development of the survivable and operational effective IAMD, integrated air and missile defense, leveraging mature regional systems. I had a conversation with Admiral Aquilino last night, and his requirements are clear: Defend the people, defend the forces, and do it on a near-term timeline.

He is system-agnostic, but when you look at the ballistic, the hypersonic, and the cruise missile threats, it drives you to mature proven systems integrated with the joint force and operational in the near term. So in coordination with INDOPACOM and CAPE [Office of Cost Assessment and Program Evaluation], the technical merits of proven regional systems will point to the architecture for our PB-22 investments.

So I will wrap up by saying space-, land-, and sea-based sensors, along with the network of weapons integrated through C2BMC

that will tie the JADC2, set the stage for hypersonic and cruise missile defense capabilities.

Thank you. I appreciate your time today.

[The prepared statement of Admiral Hill can be found in the Appendix on page 67.]

Mr. COOPER. Thank you, Vice Admiral. You covered a lot of territory there. There is even more in your testimony.

General Karbler.

STATEMENT OF LTG DANIEL L. KARBLES, USA, COMMANDING GENERAL, U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND

General KARBLES. Chairman Cooper, Ranking Member Turner, and distinguished members of the subcommittee, I am honored to testify before you today.

Thank you, especially during the unprecedented health crisis of this past year, for supporting our service members, civilians, contractors, and their families, and your continued support to space and air and missile defense.

I am here today as the commander of the Joint Functional Component Command for Integrated Missile Defense and as the Army's proponent for air and missile defense forces and capabilities. I am responsible for providing General VanHerck the soldiers who stand ready to defend our Nation from an intercontinental ballistic missile attack, as well as the soldiers who provide critical missile warning to Army and joint warfighters. As air and missile threats become more diverse and numerous from adversaries worldwide, the Army air and missile defense enterprise continues to work hard to ensure that our warfighters and our homeland are protected.

I would like to take this opportunity to briefly thank and highlight the mission accomplishments of our team of nearly 3,000 soldiers, sailors, airmen, Marines, guardians, and civilians in this challenging COVID environment that we continue to endure. During this past year, in support of STRATCOM, SPACECOM [United States Space Command], and NORAD/NORTHCOM, these outstanding men and women provided the Army and joint force with satellite communications, space situational awareness, and missile warning and defense, and protected our homeland 24/7/365 from ballistic missile attack. Even in the pandemic environment they did not miss a beat.

To outline one of the numerous examples of putting mission first and how Army families have sacrificed during the pandemic, members of our ground-based missile defense crews adhered to 12 consecutive months of stringent measures, ensuring the uninterrupted execution of their mission, including sequestering crew members from their homes and families. Essentially, our missile defense crews lived in a bubble throughout their operational rotations on this essential no-fail mission. While they and their families reside in Colorado Springs, Colorado, and Fort Greely, Alaska, the crew members were basically deployed away from their families for extended periods of time.

A positive I have drawn from this pandemic is my daily realization that I have never been more proud and thankful of our greatest asset, our people. Every day, I am awed by their dedication and

unwavering sacrifices to our Nation. I consider it an honor and a privilege to lead and serve alongside them. The continued support of Congress is critical to our ability to recruit, develop, retain, and resource such a highly qualified and mission-ready team.

I look forward to addressing your questions. Thank you.

[The prepared statement of General Karbler can be found in the Appendix on page 87.]

Mr. COOPER. Thank you, General.

General Shaw.

**STATEMENT OF LT GEN JOHN E. SHAW, USAF, DEPUTY
COMMANDER, UNITED STATES SPACE COMMAND**

General SHAW. Is my mike on?

Okay. That better? All right.

Good afternoon, ladies and gentlemen. Thank you, Chairman Cooper, Ranking Member Turner, and members of the House Armed Services Committee, Subcommittee on Strategic Forces, for the invitation to join my fellow witnesses today in discussing critical national security issues.

I am pleased to speak today on behalf of our commander, General Dickinson, and the 18,000 military, civilian, and contractor members directly engaged in and supporting the missions of United States Space Command.

As directed in the Unified Command Plan, one of those missions as the Nation's global sensor manager requires us to, quote, "plan, manage, and execute assigned Department of Defense space situational awareness, missile defense, and missile warning sensors," unquote. I am pleased to offer you the United States Space Command's perspective on that slice of our mission set, and I look forward to a discussion on how within the context of DOD's [Department of Defense's] overarching National Security Strategy our global sensor manager activities complement those of NORAD, Northern Command, the Missile Defense Agency, and the Space and Missile Defense Command in accomplishment of their respective missions.

The Unified Command Plan outlines U.S. Space Command's tasks as a supported combatant command in a newly declared warfighting domain, with a clearly defined, if rather large, area of operations. It also outlines a series of supporting tasks through which U.S. Space Command enhances the mission effectiveness of our fellow warfighting combatant commands. It is in our global sensor manager role that you see one of the best examples of the confluence of our supported and supporting roles.

Within the third of General Dickinson's key five tasks for the command, which is maintaining key relationships, exists the subtask of enhancing interoperability. Our success at the strategic level in building the key relationships necessary for protection of the homeland depends on integrating weapons system operations at the tactical level. That is why U.S. Space Command works so closely with NORTHCOM, STRATCOM, MDA, and SMDC [U.S. Army Space and Missile Defense Command], among many others, to provide missile warning and missile defense capabilities, while simultaneously and seamlessly accomplishing our space domain

awareness missions. It is an example of the classic aphorism that the whole is greater than the sum of its parts.

The ability to find synergies among these seemingly disparate missions, functions, and systems employed by distinct and separate combatant commands will significantly enhance our effectiveness in protecting and defending the United States and our allies.

I look forward to your questions on this and other examples of the coordination and collaboration among the agencies represented here this afternoon.

Thank you, Mr. Chairman.

[The prepared statement of General Shaw can be found in the Appendix on page 119.]

Mr. COOPER. Thank you, General.

We will now have member questioning, and I am going to defer my questions for the closed session.

Mr. Turner is now recognized.

Mr. TURNER. Good. Thank you.

Admiral, I will start with you. Continuing resolutions, they impact missile defense or any program that is based on ingenuity and new starts and our nuclear modernization programs, I believe, more than even just basic continuing operations. Could you please describe some of the situations that you are placed in with continuing resolutions and its effects on your programs?

Admiral HILL. Thank you for the question, Congressman Turner. It has got a broad impact across the program. Let me just kind of start where it really matters.

When you get out to the fleet and you look for supports to get the ships underway, right, we will have to work very closely with the Navy. If we try to execute a flight test, we will often find that the test ranges are suffering from the same continuous resolution and everyone will have different budget cycles. So execution of tests is at risk.

When you back—

Mr. TURNER. Okay. Could you explain why a test gets impacted more than just the general operations—

Admiral HILL. Sure.

Mr. TURNER [continuing]. Of a facility?

Admiral HILL. Yeah. So if you look at the way we fund our warfare centers, for example, on the Navy side and the way the ranges are funded, they will come to an all-stop with a continuing resolution. So we can get a ship out on station, an operational ship there, but we will not have the test support to do that. We can't get the sensors underway. We can't deploy the aircraft that are going to collect data. So that is a clear impact.

Mr. TURNER. So, frequently, you can be under a continuing resolution for a quarter of the year.

Admiral HILL. Yes, sir.

Mr. TURNER. So for 3 months out of the year, your schedules are set back. Your work product is set back.

Admiral HILL. Well, and we will do our best to catch up on schedules and deconflict and reschedule where we can, but it is a significant impact when it comes there. Then if you back up even further to say production, normally we will be okay. We can carry production for some period of time. But if we start, you know, hold-

ing up payments to the contractor, you won't see us proceed in those areas. So there could be a, you know, a shortened gap there or something that cascades to the right. And that really translates to cost, right?

So when you back up to development, now it comes to the stability of the team. Right? So just looking at the government team, you know, it casts a shadow, right, on the future of their careers, and oftentimes, we find ourselves losing talent during that sort of phase. And then if you go, again, to warfare centers and government labs that are on reimbursable funding and those sorts of things, we put them at an all-stop and freeze them.

Mr. TURNER. Does it affect cost and time delivery?

Admiral HILL. Absolutely. It will always have an effect on cost and time delivery.

Mr. TURNER. General Karbler, examples, ways in which continuing resolutions affect your operations?

General KARBLES. So, much like what Admiral Hill just talked about, we run the Reagan Test Site. So, again, it affects our ability to support those tests that we do for the DOD out of the Reagan Test Site in Kwajalein Atoll.

Mr. TURNER. General VanHerck, General Shaw, this is your chance at a commercial. Anything you—any anecdotal stories you want to provide, any information as to how you have seen continuing resolutions be detrimental?

General VANHERCK. It is about predictability, Congressman, and being able to move forward based on a plan to execute it strategically. For me, directly, in defending homeland defense, I will be able to continue that mission. The most direct impact, and as you heard in my opening statement, is keeping pace with potential threats and adversaries. And the programs that Admiral Hill and General Karbler talked about, if we further continue to delay those, the risk is we fall further behind in defending the homeland. Thank you.

General SHAW. Congressman, I would just echo what General VanHerck said that combatant commands demand capability as soon as they can possibly get it. And any continuing resolution that delays that capability, whether it is testing or fielding or development, is a delay in our ability to sustain readiness against an adversary.

Mr. TURNER. Ms. Tomero, in the 2017 NDAA, fiscal year 2017 NDAA, the Secretary of Defense was required to designate a single entity as a lead acquisition organization for defending the homeland. I am going to ask you this question in the general. You are in the unique position of playing catch with yourself. There is a bunch of things that happened while you were here that you now have over at the Pentagon, things that need to be completed that are not, that you even had a significant interest in occurring.

What are some of the priorities that you have to make certain that the Pentagon finishes and gets over to Congress things that you worked to compel them to do?

Ms. TOMERO. Ranking Member, thank you. Yes, it is an honor to—sorry. It is an honor to catch those congressional requirements now in my new position.

With regard to designating the single authority for cruise missile defense of the homeland, that is something that the administration is going to look at. My understanding is that the previous administration looked at it and decided not to designate a single authority. We do understand that there are capability gaps. We need to look at where and how to prioritize cruise missile defense of the homeland.

There are cost issues. I know the Congressional Budget Office identified significant costs ranging from \$75 billion to \$80—\$180 billion over 20 years. So that would include acquisition, also operation—operationalization of the system, maintenance over the long term.

But I think what we need to look at is, what is the viability of our capabilities, what are the costs, and how do we prioritize that defense?

Mr. TURNER. I yield back. Thank you.

Mr. COOPER. Mr. Langevin.

Mr. LANGEVIN. Thank you, Mr. Chairman. Can you hear me okay?

Mr. COOPER. Very good.

Mr. LANGEVIN. Thank you. Thank you, Mr. Chairman.

I want to thank our witnesses for your testimony today.

In particular, I want to welcome back and welcome to the committee, Ms. Tomero. And, Leonor, I enjoyed your work on the committee when we worked together, and it was really a big loss to the committee when you left but the Department's gain, and I wish you well.

I want to thank everyone for your service to our Nation.

I want to begin on a directed energy question. I have to say I am really disappointed that the President's budget canceled MDA's directed energy program. This program provides promising ballistic missile defense technology, and it really addresses costs and balances between offense and defense.

Admiral Hill, who made the decision to cut the program and why?

Admiral HILL. Congressman Langevin, thanks very much. Great question. I would say it was a Department effort to consolidate directed energy work within the Department. And so I will, you know, work closely with the Under Secretary for Research and Engineering, and when these capabilities reach the power levels and the sizing levels that we need, being control, stability, lethality capability, then we will adopt those technologies and bring them into the missile defense system.

Mr. LANGEVIN. Okay. I am unclear. Was the decision made or recommended under this administration or the previous administration?

Admiral HILL. It was prior administration. Yes, sir.

Mr. LANGEVIN. I see. Thank you.

How much transparency and input will you have into this new arrangement to ensure the technology fits missile defense requirements?

Admiral HILL. Yes, sir. Thank you. I think that is on us to ensure that we stay close to the Under Secretary's lead for directed energy so that we can influence the requirement, so they under-

stand what our powers are, what our concept of operations are, how we would leverage that technology. I don't see that that is an issue in terms of having access and transparency into the roadmaps that lead to those capabilities going to industry.

Mr. LANGEVIN. Okay. It is my understanding that you would have very little transparency into the funding, though.

Admiral HILL. That is true. I don't have a good look into the funding. All I know is that the funding was removed from the missile defense budget.

Mr. LANGEVIN. So I just want to say, I think that that decision from the last administration should be reevaluated. That is my assessment. If we move these programs out of your agency, I will—I believe we're going to keep them in the labs, the technology in the labs, to test them to death, and they will never get to the warfighter. At best, it is wasted money. At worst, our systems can't keep up with what adversaries are developing.

So the decision also cut the diode-pumped alkali laser program, and I am concerned about that, but let me get to something else in another area.

So our adversaries built electronic warfare systems that are specifically targeted to undermine our technological command and control advantages, especially overseas.

General Karbler and Admiral Hill, how effective is our missile defense network in a contested spectrum environment, and what improvements do we need to make?

General KARBLE. Thanks, Congressman. So every day, within our missile defense systems that we have, we have got to practice—we have got to have cyber protection and we have resiliency of the Ballistic Missile Defense System. We collect, analyze, report digital data. We deploy and maintain our network defense tools. We are constantly evaluating our network defense operations and then we respond to incidents, and we work very closely with the Missile Defense Agency as any of those potential incidents come up.

Admiral HILL. Yes, sir.

Mr. LANGEVIN. Thank you.

Admiral HILL. And then from my perspective, you know, working closely with the combatant commands and with the operational forces and the services, because all of the—you know, when you look at the missile defense system writ large, it cuts across all of the above, and so we have to do a lot of coordination there. But we are doing the overall, you know, insider work. We are doing the adversarial assessments. We are just now starting to work with DOT&E [Director, Operational Test and Evaluation] to do something called persistent cyber operations to where we will be 24/7 monitoring and healing the networks as we go.

For me, I want to know where vulnerabilities are. So it becomes a very sensitive topic right away, but we have got great relationships with USCYBERCOM [United States Cyber Command], with Strategic Command's cyber group, and, of course, DOT&E.

So I think we are in a much better place. If you had asked me this question about 3 years or so ago, we were learning how to crawl. We are definitely walking very fast right now and almost about ready to run as we go into persistent cyber operations.

Mr. COOPER. The gentleman's—

Mr. LANGEVIN. My time has expired. I have some questions I will submit for the record. I appreciate you responding. Thank you.

I yield back.

Mr. COOPER. I thank the gentleman.

Mr. Wilson.

Mr. WILSON. Thank you, Mr. Chairman.

And thank each of you for being here today and your service for our country.

And, Ms. Secretary Tomero, Israeli families face the threat of larger, more sophisticated rocket and missile arsenals every day provided by Iran to Hamas and Hezbollah. To address this mounting threat, Israel and the United States are working together to develop and deploy a multitiered missile defense system. The U.S.-Israel Memorandum of Understanding on security assistance provides for \$500 million in funding for annual missile defense cooperation with Israel.

Do you support the continued funding for the joint U.S.-Israel missile defense programs, including Iron Dome, David's Sling, and Arrow? And can you speak on the progress of the development of Arrow-4?

Ms. TOMERO. Congressman, thank you very much for that question. Yes, there is strong support for continuing those programs. They have had a record of success over a long time, and we continue our very close collaboration and cooperation with Israel. I think on the details of the development of Arrow, I would like to defer to Vice Admiral Hill.

Admiral HILL. Sir, Arrow-4 is going very well in terms of laying down the requirements for that system. In fact, as soon as the COVID-19 restrictions lifted, we had a team onsite, working very closely with IMDO [Israel Missile Defense Organization] to lay out requirements and to lay down the development path. So I think we are on a—in a good place with the Arrow-4.

Mr. WILSON. Thank you very much.

And, Secretary Tomero, another country that is under threat, and an inventory of short-range missiles will provide and improve Taiwan's ability to deter Chinese aggression by credibly disrupting, degrading, and interdicting Chinese command and control nodes, military airfields, supply depots, and reinforcements in response to an attack.

Does the administration support Taiwan's ability to defend itself through layered deterrence by including enhanced missile capability?

Ms. TOMERO. Congressman, we strongly support deterrence and are investing in capabilities to deter a Chinese attack in the area.

Mr. WILSON. Thank you very much.

And, additionally, General Karbler, I am grateful that the support, which has provided for funding Israel's combat-proven Iron Dome system in the FY [fiscal year] 2022 budget request. The Army has purchased two Iron Dome batteries. It has been reported that the Department is considering purchasing more.

Has the Army determined where and when the batteries will be deployed? Is the Army not considering purchasing more batteries? Which parts of the system can be incorporated as part of an indirect fires force protection capability?

General KARBLE. Yes, sir. I had a chance to go visit the Iron Dome, the U.S. Army soldiers who are on the two batteries' worth of Iron Dome equipment up at White Sands Missile Range. So I visited them a couple of months ago as they go through their training.

At the end of this month, we will see an Iron Dome live fire executed by those soldiers. They will wrap up their field training exercises and certifications with the goal that the first battery will be ready for worldwide deployment by September of this year and then the second battery shortly thereafter. Discussions about future deployment, I would like to take that in the closed session, if I could.

Mr. WILSON. Absolutely. Gosh, that is very encouraging.

And, Admiral Hill, the valued American territory of Guam is a key Western Pacific theater operations logistical hub for our Navy, making it a priority target for the Chinese Communist Party. The Missile Defense Agency's FY 2022 request includes \$118.3 million to develop an architecture for defense of Guam. Your agency has not yet actually detailed what type of system this would be.

Given China's increasing hostile pressure and the largest peacetime military buildup in the history of the world, when can we expect to have a detailed overview of the system and its deployment timeline?

Admiral HILL. Thanks, Congressman Wilson. We are working that very actively. Last night, I mentioned in my opening comments, discussing this with Admiral Aquilino last night. You will see those details when we deliver the report to Congress. We are on path to deliver that from MDA to the CAPE and have a discussion with INDOPACOM within the next couple of weeks.

I think we had promised June, but given the complexity of it, it is going to take us a little bit longer to get there, but we will definitely outline with the detail based on the threat set, which is ballistic, cruise, and hypersonic. We are going to leverage mature systems, and we are going to procure those areas that we need for long lead in order to hit the timeline. It is a very aggressive timeline, given where we are at.

Mr. WILSON. Thank you very much.

Admiral HILL. Yes, sir.

Mr. WILSON. I yield back.

Mr. COOPER. I thank the gentleman.

Mr. Moulton.

Mr. MOULTON. Thank you, Chairman.

Threat detection and reaction time are clearly key to effective missile defense, and both of those depend on software. But it seems that our current system of acquisition is designed to keep us a step behind, because we lock into contracts with a single company or single consortium for years at a time, assuming that that company has ability or incentive to update the software on the system at the speed of relevance, which often they don't. The world has long since become software-centric, but DOD is still stuck on hardware-determined development.

So, Vice Admiral Hill, what is your organization doing to make sure that your system software can be upgraded regularly, will be upgraded regularly? Because I struggle to imagine an area where

it would be more important to have the fastest and most accurate software running our defenses.

Admiral HILL. Thank you, sir. Great question. And I will just highlight two programs and give you some hints in some other areas.

We have adopted agile software processes across nearly every program within the Missile Defense Agency in coordination with the services. So we have got very strong linkages with the Navy on Aegis, for example. When you look at the command and control battle management, which is that hardened network that brings everything together, that is our all-domain networking that will be tied to JADC2 downstream. That is in a spiral upgrade.

That program, early on we recognized because of the numbers of sensors that changed, the weapons that change along the way, that that one has to be a spiral and in constant evolution. That is another great example of very agile, quick software turns and delivery to the combatant command, because that happens to be where the warfighter touches the system, through C2BMC.

And then the last thing I will mention is on the new contracts for Next Generation Interceptor, it is actually written into the contract and the program offices, two of them, because we have a competition here, are definitely tied into DevSecOps, the agile framework, and using digital engineering. That is a whole new thing. We have got the latest and greatest tools to go execute that, and that will become really the standard that we use across the agency.

Mr. MOULTON. But, Admiral Hill, if 10 years from now within the missile's lifetime a different company has a better—has better software or you simply have a company outside the consortium who has a better discriminating radar, some component like that, do you have the ability to go outside and pick this component to add to the missile system?

Admiral HILL. Absolutely we do. And so by having modularity as a requirement in NGI, for example, that gives us the ability to go to those third parties, those innovation sites. In fact, I am going to visit the United States Navy's Forge, a new establishment that they have now for the Aegis system, and we are going to talk about modularity and the complexities of bringing in innovation and the third parties.

I am not quite sold that we can do that right yet, but we are having very close conversations on incorporating exactly what you are talking about. How do we bring in the small business? How do we bring in, you know, different thinking? Now, you have to have a structure to that, but we are working our way through that.

Mr. MOULTON. Okay. Vice Admiral Hill, you have said we rely on nuclear deterrence to address more complex threats to include near-peer hypersonic missiles. But I am concerned we do not have a vision for managing this emerging threat that does not potentially increase the risk of a nuclear response. So far, I have asked this question a couple of times and have yet to receive a satisfactory answer on what the Department's vision is for how we approach the emerging threat from hypersonic missiles or pursue our own hypersonic capabilities in a way that deters rather than destabilizes.

So, Vice Admiral Hill, is deterrence still sufficient in the face of this evolving capability?

Admiral HILL. Congressman, I think Policy would be better to answer that. I will tell you, for hypersonic missile defense, we are targeting the regional threat and—but I will turn it over to Ms. Tomero to talk to you about the overall policy.

Mr. MOULTON. Great. Thank you.

Ms. Tomero.

Ms. TOMERO. Thank you. Thank you, Congressman.

Yes, this is something that we are going to take a close look at as part of the Missile Defense Review, the Nuclear Posture Review, and as they feed into looking at a more integrated approach to deterrence, looking at the threats across domains and looking at the risk of escalation. So the challenge you alluded to is one of the—

Mr. MOULTON. Ms. Tomero, look, I understand that this did not originate with this administration, that it is the last administration that has failed to develop any strategy here. But let me just point out how insane it is to be pouring billions of dollars into an advanced weapons system that we don't know how we are going to use and, worse, might actually make deterrence worse. So this has got to be an absolute top priority.

Mr. Chairman, I yield back.

Ms. TOMERO. Yes, it is. Thank you.

Mr. COOPER. I thank the gentleman.

Mr. Lamborn.

Mr. LAMBORN. Thank you, Mr. Chairman.

Admiral Hill, I am wanting to talk to you about the 44 deployed Ground-Based Interceptors. And is there a point over the next few years in which we will be dipping below that number?

Admiral HILL. Congressman Lamborn, thank you. Great question.

When we had this conversation about a year or so ago, we saw reliability, you know, falling off a lot earlier than what I actually believe it will fall off to, and that is mostly because of the support from Congress and the service life extension program [SLEP]. So our ability to take those oldest rounds out of the ground—you know, there is three classes of the GBI. The oldest ones have never been de-emplaced. And so by taking them out, replacing the boosters, fixing one-shot devices, upgrading the processors, updating the threat libraries, that raises the capability from what we have today.

So, in addition to keeping the number, we are now going to increase the capacity because the capability goes up. And that is something that NORTHCOM can then consider as they look at assessing their shot doctrine. So that the SLEP program, very important. If you were to ask me about that timeline to get the NGI, the criticality of that reliability program can't be stated more strongly than the fact that we have got to do that work so that we are hardware based and we really know, as opposed to the analysis that we showed you last year, which was based purely on analysis, now we have hardware by which to do that. And we have some number of those that we have removed already to do that replacement.

So there is some period of time where we will have a little bit of a dip, but we will coordinate that with NORTHCOM before we do that. But, again, capability being increased is the offset.

Mr. LAMBORN. Okay. Thank you.

And I want to follow up briefly on something my friend and colleague, James Langevin, brought up, and that is funding for directed energy. Apparently, the money—there will still be money on this research and development in other parts of DOD. It is just the MDA segment that is being cut for this year. Is that correct?

Admiral HILL. Yeah, that is correct. So, you know, because I am so focused on this mission, which is very discrete and has a totally unique requirement on how we would leverage directed energy, it just means I have to change the way I do business. Right? So rather than direct funding and transitioning to industry, I will rely on the Under Secretary's office to do that for me.

And then I am working very closely with the services. One example would be that when the Navy deploys its based offense of a lower powered directed energy, we can take that and use that once it matures and raise the power even more to go do the ballistic missile defense mission. So it just changes the way we do business.

Mr. LAMBORN. Okay. Thank you. That is reassuring and compared to how it first appeared.

And then, second, along that line, just a comment I will make, not a question, and that is, we will continue to work on cooperative programs with the state of Israel on joint research and development of directed energy in the missile defense, especially short-term, short-range missiles and rockets.

Ms. Tomero, I would like to ask you a question. It is great to have you in the—on, I guess, on that side instead of this side of the chairs here.

But now that the new administration is working on a Nuclear Posture Review, do you anticipate any changes of policy pursuant to the results of that review when that comes out compared to the last administration?

Ms. TOMERO. I mean, I think there will be continuity in certain areas, change in other areas, and we are about to start the posture review in a couple of weeks, and so that will be—you know, the analysis and reviews will be performed over the summer. And so what I can tell you is that we are going to look at where there might be some change, but that will be underpinned by analysis and thorough reviews.

Mr. LAMBORN. Okay. I will be watching that with keen interest. Hopefully, more continuity than disruption and change.

And, lastly, General VanHerck, you have previously testified that with regard to the current North Korean ICBM capabilities, you are comfortable with our present missile defense capabilities.

A little glitch there. Please add time back to my clock.

But, in your best judgment, do you still agree with the assessment that the North Korean threat will begin pacing our homeland defenses starting in 2025, and so we will need to supplement or enhance the current GMD system to maintain parity—or overmatch, actually?

General VANHERCK. Congressman, I believe we should talk about that in a classified forum. I tell you, I am comfortable with the pro-

grams that we have in place right now for Next Generation Interceptor fielding by 2028 with incentives—incentives to pull further left, if able, between the two companies that are competing. Happy to discuss further in a classified environment.

Mr. LAMBORN. Okay. Thank you very much.

Mr. Chairman, I yield back.

Mr. COOPER. Thank you.

Mr. Morelle.

Mr. MORELLE. Thank you, Mr. Chairman. And thank you to all the witnesses for their expertise, their time, and certainly their service to the country.

I had a couple of just brief questions, if I can, for General VanHerck. By the way, thank you, General, for engaging. I appreciated our offline conversation a great deal yesterday. I was reflecting on it, and I think you and I were talking about the nature of conflict having become a global engagement. And I was—I think I was commenting, as I am new to this committee, about sort of the combatant commands being more regional in nature, and we were having this conversation as I was reflecting on it.

I wondered if I could ask you to just talk a little bit more about the nature of it and how it has really become a global engagement. I know our combatant commands are structured regionally, but could you talk a little bit more about how you see it and, specifically, of how having domain awareness is a critical element to the success of that global engagement, and then a little bit maybe about the challenges potentially that it poses for you?

General VANHERCK. Congressman, absolutely. So in today's global environment, what you see is all problems for the most part, especially with Russia or China, but even with the invention of the internet and nonkinetic capabilities, even rogue state actors or even non-state actors have the potential to have global influence through their activities, both in day-to-day competition and in crisis.

My homeland defense design doesn't start with defending the homeland inside the borders of North America or United States. It actually starts from a global perspective, relying on my fellow combatant commanders, other nations such as NATO nations, and our allies and partners around the globe to have domain awareness. They have sensors and capabilities. And if we share information from undersea to on-orbit, to include human information, to give us a global picture, we will be in a much better position. So our homeland defense design focuses that way. I hope that helps clarify.

Mr. MORELLE. Yeah. And I am just—any challenges that poses, or do you feel as though the design is sufficient, there is enough situational awareness that the regional combatant command approach can sufficiently meet those global challenges?

General VANHERCK. Congressman, from a domain awareness perspective, I still see challenges. That is why you will see in my unfunded priority list, after we saw the fiscal year 2022 budget, is for—the top of it is over-the-horizon radar capabilities to give us that global domain awareness. The competitors have extended their range to be able to hold our homeland at risk.

In addition to that, you see Arctic communications on my unfunded priority list, which gives us the ability to share data glob-

ally and to operate in the Arctic. The same thing, as Represent—or Ranking Member Turner mentioned, is the elevated radar as well here is an unfunded priority to give domain awareness against potential cruise missiles and, finally, over-the-horizon polar radar capabilities.

So I think there is room to grow. I am encouraged by the budget for ballistic missile defense—I think we have room to grow—cruise missile defense, domain awareness. I am also encouraged with what the Navy did with regards to undersea domain awareness with almost \$1 billion in their undersea domain awareness.

Mr. MORELLE. In just a little more than a minute that I have, General, we talk quite a bit about ballistic missile threats. Can you talk to me a little bit more about cruise missile threats, and has that changed over the last few decades? And is there anything we should be considered about, anything that you are concerned about?

General VANHERCK. Congressman, absolutely. Russia has developed the capability through long-range cruise missiles that provide a very low radar cross-section that are incredibly challenging to detect to our legacy North Warning System and to our platforms that exist today. That is why, again, domain awareness is a priority for me, to give us that longer range ability to detect that.

In the not too distant future, 5 to 10 years, China will be in the same position. Russia has developed capabilities from undersea with their advanced, very quiet, nearly on par with our submarines to field that capability and their bombers, to include polar over-the-horizon capabilities and also surface vessels.

So I am very concerned about the cruise missile defense of the homeland and something we could talk more about in the classified session.

Mr. MORELLE. Terrific. Well, look, I appreciate very much your insights.

And, Mr. Chairman, I appreciate the opportunity to offer those questions. And with that, I yield back. Thank you.

Mr. COOPER. Thanks. The gentleman is down to the final second. Congratulations.

Mr. Brooks.

Mr. BROOKS. Thank you, Mr. Chairman.

Vice Admiral Hill, the Missile Defense Agency will be undertaking a new major development effort with the Next Generation Interceptor program while concurrently restructuring the existing Ground-Based Interceptor program going from a single contract to multiple contracts.

What assurances can you give this committee that the MDA is approaching this program transition in a way that reduces risk while continuing to meet or exceed the current schedule?

Admiral HILL. Thanks, Congressman Brooks. We did a top-down, bottoms-up restructuring of Missile Defense Agency writ large at the beginning of 2020. A lot of folks call it MDA 2.0. And what we mean by that is when we stood up the two contracts as we prepared to make that award, we had to start early on constructing two separate program offices with the right certified board leaders that were going to be in charge of that, put all the conflict-of-interest issues on the table, make sure we had all the firewalls up.

We brought in a technical direction agent, new for the GMD program, so that we can leverage the UARCs [university affiliated research centers] and FFRDCs [federally funded research and development centers], bring in that additional talent coming in. I mentioned before that we are moving to digital engineering and DevSecOps. That program to me is a model program within the Department of Defense in terms of how we are doing business. Two contracts competing, pressure on industry, reducing risk.

We are seeing IRAD [independent research and development] investments being made in the critical areas that we were concerned about when we were dealing with the RKV [Redesigned Kill Vehicle] program. So I think we have got it right. Plus, we have got a great set of operational needs statements coming from the combatant command. We have got a strong set of requirements that were endorsed by the JROC. This is a new and different Next Generation Interceptor, and I think we are poised to take it on. We have got the right professional team in place.

Mr. BROOKS. Another question unrelated to the previous one. China is rapidly developing multiple hypersonic weapon systems. America is developing hypersonic missile defense programs at the speed of relevance is necessary to deter Chinese aggression and defend against future attacks.

The Missile Defense Agency's unfunded priority list for fiscal year 2022 includes a request for additional funding for hypersonic missile defense efforts. Will you please share with this committee how the requested funding would accelerate development of this capability?

Admiral HILL. Yes, sir. And if we were to rewind and go to last year, we were focused on the science and technology [S&T] of operating in that very unique environment of the glide phase. But after viewing many of those real-world flight events, to include, you know, actual U.S. test events, we were able to show that with our models of the systems, which are very high fidelity, that we can, in fact, close the fire control loop.

And so one of the reasons we are focused right now on the Aegis capability with its proven engage-on-remote capability is the fact that we can track in glide phase. We can have a ship upstream before you ever get the space constellation in place, pass that data to a ship, and close the fire control loop.

So what is missing in that equation is the interceptor. And so we put out a broad area announcement earlier this year, and in PB-22 you see an acceleration of that program. So moving away from an S&T program that was focused in on the mid 2030s to a program that is focused on this decade, and so that is what we are doing. So when you look at the plus-up area, that will continue some of the parallel work to reduce risk in that program.

Mr. BROOKS. Can you update the committee on the status of the Hypersonic and Ballistic Tracking Space Sensor capability, which is absolutely necessary for tracking hypersonic missile threats from launch and throughout the missile's flight?

Admiral HILL. Yes, sir. Thank you for asking about the HBTSS, Hypersonic and Ballistic Tracking Space Sensor. So as you know, we took a very measured approach to this. We started with a number of companies in the concept of development. Then we neck

down to four companies that we put through what we call a clutter management demo, which meant we are coming from space looking down on a warm Earth at warm targets, you know, and could we develop the algorithms to extract those targets out of that scene, and we were very successful on the ground.

So where we are now is we have down-selected to two contractors, so we have a competitive approach again. So two companies in NGI, we have got two companies on the glide phase interceptor program, and we have got two companies on HBTSS, that that competitive pressure, and we are going to put two of those up in orbit in fiscal year 2023, two different companies with a requirement to be interoperable, and we are going to connect them to our flight test in the INDOPACOM region, so HBTSS on path to get to demo on-orbit in fiscal year 2023.

Mr. BROOKS. Thank you, Mr. Chairman. I see I only have a few seconds left, so I will yield back.

Mr. COOPER. We appreciate the extra 16 seconds there.

Mr. Horsford.

Mr. HORSFORD. Thank you, Mr. Chairman.

And thank you to our witnesses for testifying today. It is really great to have your expertise and insight. It has been very informative.

Vice Admiral Hill, in March of 2018, General Hyten testified to the Senate Armed Services Committee that when it comes to hypersonic weapons, specifically China's DF-17, hypersonic boost glide vehicle, quote, "We don't have any defense that would deny the employment of such a weapon against us."

Last week, you testified to the same committee that the Aegis Sea-Based Terminal is, quote, the first regional [brief audio malfunction].

Okay. Last week, you testified to the same committee that the Aegis sea-based terminal is, quote, the first regional hypersonic missile defense capability that is deployed with the aircraft carrier strike groups today, and it is important that we have that capability now because the hypersonic threat is there now.

So my understanding is that last operational test of the Aegis system and the SM-3 block IIA interceptor was conducted in November 2020 against a simple ballistic ICBM threat during FTM-44. So I am curious if any additional advancements have been made since General Hyten's 2018 testimony that have changed the DOD's assessment of the effectiveness of Aegis against the hypersonic threat?

Admiral HILL. Okay. Congressman, thank you. So I am going to separate two things for you. FTM-44 with an SM-3 is a midcourse engagement of a ballistic missile, so that is separate and distinct. When I say Sea-Based Terminal, that is leveraging the SM-6 missile down in the atmosphere where it is maneuvering and going after a high-value unit. And I think that is what your question is really centered on.

We are on what we call Increment 2 today with a upgraded version of SM-6, and we are testing that over the course of the next year. Increment 3 will bring in a broader set of those threats.

So it was a true statement last year, because what we were really designing against in the early increments was against the ma-

maneuvering threat but it was still pretty much a ballistic missile. But when you actually take a look at the maneuver space of where we are today and with the Increment 2 capability, that is a hypersonic threat because it is maneuvering at very high Gs [gravitational force] and it is going at a very high speed.

So we are building upon that. That is that first layer. And when I talk about a glide phase interceptor, that is the layered defense to where we go after it earlier in the trajectory before it comes down into the atmosphere and becomes the maneuvering problem. Does that make sense?

Mr. HORSFORD. So as a mission-capable kill vehicle for currently fielded hypersonic weapons, is the interceptor capable of performing this function?

Admiral HILL. It is capable of performing that function in the atmosphere against a series of threats, and its limit would be the airframe, which I can't talk about today.

Mr. HORSFORD. And a question for Ms. Tomero. Other than the deployed Aegis systems, how are we currently defending against or mitigating the hypersonic threat for our forces deployed in the Indo-Pacific?

Ms. TOMERO. Congressman, so we are, as mentioned, focusing the priority for hypersonic defense as a regional threat. We are also looking at increasing the defense of Guam as well, in the context of a conflict in the Indo-Pacific.

And so those are all capabilities that are being further studied and looked at both from the Missile Defense Agency and also the Office of Cost Assessment and Program Evaluation, and so increasing those investments and prioritizing capabilities will feed into the fiscal year 2023 budget request.

Mr. HORSFORD. Thank you.

Mr. Chairman, I have a few other questions that I will ask and take offline of the official proceeding. Thank you, and I yield back.

Mr. COOPER. I thank the gentleman. He has given me back 19 seconds. Very grateful.

Mr. DesJarlais.

Dr. DESJARLAIS. I will try to do a little better because a lot of my questions have already been answered, and, General VanHerck, I think your opening statement laid out a lot of those. It is clear that the homeland defense is bearing the brunt of real-dollar defense cuts, and that is going to require to allocate some risk.

So just briefly, General VanHerck and then Vice Admiral Hill, if you don't mind, can you each provide an assessment of the threat posed by our adversaries to homeland below the nuclear threshold, things like the Colonial Pipeline cyberattack, and then how comfortable are you with the current defense capabilities to address these threats?

General VANHERCK. Congressman, thank you for that. First of all, I believe the foundation of homeland defense is the nuclear deterrent. But right now what you see is after three decades of watching the way we project power forward, Russia and China specifically are developing capabilities to hold the homeland at risk below the nuclear threshold. Those capabilities would include very quiet submarines.

They just fielded—Russia just fielded their second *Sev*-class submarine, which is on par with ours. Within a 5-year period or so, they will have eight to nine of those submarines, which will be a persistent proximate threat off of our east and west coast that we haven't had ever in the past. China will be about a decade behind. Russia has upgraded all their bombers to include their nuclear bombers and nuclear capabilities. Russia has fielded already hypersonic glide vehicles launched off of ICBM capabilities to hold the homeland at risk.

With regards to non-kinetic capabilities, I think if you just look at recent history that you will see that there are significant vulnerabilities in the non-kinetic, especially cyber, that we need to take a look at and probably look at—more broadly at policy across the board and make sure that we are as efficient, effective with the limited resources we have for cyber defense, which includes homeland security as well as DOD. I hope that clarifies that.

Dr. DESJARLAIS. That does. Thank you.

Admiral Hill, do you have anything to add to that?

Admiral HILL. So what I will do is I will just go down to the specifics of ballistic missile defense. I would say, what has changed over the last couple years, and you can read about it in the white press, you know, you look at some of those launches that occurred back in 2018, dogleg maneuvers, right, just right right off the bat, maneuvering in space, what I call range extensions. They are all hypersonic when they come back into the atmosphere.

So what used to be a very predictable ballistic profile, that has now changed, and it is a challenge to the sensor architecture. It goes back to General VanHerck's comment about all-domain awareness, because it is very important that we continue to invest in the sensor capacity that we have against ballistic, hypersonic, and cruise, because they are converging and they are coming at us, you know, across that whole integrated air and missile defense domain.

Dr. DESJARLAIS. All right. Thank you.

And, Chairman, I think that is like real time there. I yield back.

Mr. COOPER. Well, Mr. DesJarlais is the prize winner. Two minutes returned. We are grateful.

Mr. Garamendi.

Mr. GARAMENDI. Thank you, Mr. Chairman. Really, a very important hearing.

Thank you, gentlemen and lady, for participating today. I am going to take this in a slightly different way. I have been on this committee 10 years now, and we have spent billions upon billions trying to create a defense, and it seems the faster we go, the behinder we get.

General VanHerck, you just mentioned getting behind on submarines, getting behind on hypersonic missiles, getting behind on intercontinental ballistic missiles, ground-based missile defense, and so forth.

The President is going to be in Geneva tomorrow to talk to Putin. Should he be talking about arms control in the domain in which you are operating? Ms. Tomero first.

Ms. TOMERO. Chairman Garamendi, yes, we anticipate that there will be a focus on the need for increased strategic stability and building on the progress of arms control and building on the foun-

dation of extending New START [Strategic Arms Reduction Treaty].

And so within the Department of Defense, that will be part of the look at integrated deterrence, having arms control as part of that, but also, again, looking at across domains and the risk of escalation across domains including nuclear.

Mr. GARAMENDI. So the quick answer is, yes. With regard to each of you, General, Admiral, General, General, what would be the first thing you would want discussed in an arms control negotiation?

General VANHERCK. Congressman, first of all, I think that in the arms control discussion these days should not be unilaterally with a single country with the two peer competitors that we have. It would be nice to have that discussion with both Russia and China.

I do believe there is opportunities to discuss arms, including non-kinetic, such as cyber and space, where we can establish lanes in the road where I am very concerned about unintentional escalation in those areas. Ideally, I would love to get rid of all nuclear weapons. That genie is out of the bottle, and I don't think we can.

So there ought to be a discussion on strategic stability with the three nations that we are talking about with regards to nuclear weapons, with regards to hypersonic capabilities, with regards to space capabilities as well. I will defer to give them some more time.

Admiral HILL. And, Congressman, I am not a policy person so it is probably just not appropriate for me, but as a technical geek, I will tell you that the reality is the threat does evolve, it becomes more complex, and we are going to have to make a decision on whether or not we want to deal with that.

Mr. GARAMENDI. You know I am not going to let you off the hook that easy, but let's move on.

Mr. Karbler.

General KARBLES. Congressman, again, I am not a policy expert. I am an air and missile defense officer, and so—

Mr. GARAMENDI. Wait, wait, wait, wait. The four of you know more about this than most anybody else. So I understand you are not policy; my question is, what would you want to be discussed?

General KARBLES. Any discussion on arms control we have got to make sure that the parties that participate, whatever is agreed to would be verifiable by both countries or whatever countries are parties to that.

Mr. GARAMENDI. Trust but verify. I have heard that before, and it has worked before.

General Shaw.

General SHAW. Congressman, so the space domain is—it is not a global common; it is an exo-global common. And so I would echo what General VanHerck said, that whenever you talk about something in the space domain, you have to involve all the parties that are participating in that, so we have to be multilateral.

I would think the first thing I would want to look at the space domain is norms of responsible behavior within that domain, expectations of what is professional behavior versus nonprofessional behavior, things that would help us to avoid escalation in that domain that could lead to a crisis globally.

Mr. GARAMENDI. I think Putin has put that on the table already, and two of you, two of the four have already said that would be a good starting point.

I appreciate your comments on this, Admiral Hill. You know I am coming back at you and going to get into detail, and General Karbler, the same. While you say you are not policy, there is nobody around that knows more about policy than the two of you or the four of you, five of you. Thank you very much. I will yield back.

Mr. COOPER. I thank the gentleman.

Mr. Waltz. They have called votes so we have four people remaining. We are going to end this public hearing in about 10 minutes, so the shorter you go—

Mr. WALTZ. I will be quick.

Mr. COOPER. Okay.

Mr. WALTZ. Thank you. Thank you, Mr. Chairman.

General VanHerck, I just wanted to commend NORTHCOM for its Arctic strategy. It was pretty comprehensive, called for developing strategic partnerships in the region, enhancing Arctic operations, capabilities, infrastructure, and a credible defense presence.

I noticed in your Senate testimony, in response to Senator Sullivan's question where the various services were implementing their respective Arctic strategies as part of the President's budget, your response was, we didn't move the ball very far this year in the budget with regards to resources in the Arctic. Can you flesh that out. What capabilities, what infrastructure would you like to see prioritized by the Congress that went unfunded in the budget?

General VANHERCK. Congressman, I would point to my unfunded priority list first for domain awareness with over-the-horizon radar capabilities, Arctic communications capabilities, as well as polar over-the-horizon.

You mentioned infrastructure. Infrastructure in the Arctic is crucial to be able to project power, not only during conflict or crisis but to campaign and create deterrence on a day-to-day basis. Additional infrastructure, I think that would be helpful.

And when we talk about competing in the Arctic, what I am talking about is persistence. And to have persistence, you have to have the ability to remain in place, and that would include having a potential port north of Dutch Harbor for vessels to refuel, whether they be Coast Guard or Navy vessels as well.

Additionally, some things I think we could do better to compete in the Arctic. I believe, in a crisis or conflict, with the forces that we have—and we are blessed to have significant forces in the Arctic that are assigned to INDOPACOM but in the NORTHCOM AOR [area of responsibility]—more than 100 fifth-generation fighters, I believe those fighters will likely deploy especially to a European or an Indo-Pacific crisis.

In that situation, I would love to have the ability to have forces that would backfill them, that are organized, trained, and equipped to operate in the Arctic. Unfortunately, we don't have that today, and we need to identify some of those forces. I hope that lays out a little bit of the picture.

Mr. WALTZ. That does, General. Thank you. And just to be clear, we do not currently have a persistent naval presence or a persistent ground presence facing north in the Arctic, and I

think that is something this committee overall should take a hard look at.

I just wanted to very quickly follow up. Admiral Hill, what have your conversations been like with your Israeli counterpart with regards to their recent conflict? President Biden is committed to resupplying Israel with Iron Dome interceptors that were expended. Can you give us a status on that?

Admiral HILL. I can tell you about our input to that. As you know, we have got the partnership co-production on Iron Dome, co-development work that we do with the Arrow system and with the David's Sling. The conversations that we had with IMDO were really to kind of back check, you know, costing of what we develop. So as they put together their submittal for that special appropriation, they kind of wanted a back check on that, and that is just part of our partnership.

But it is better for Ms. Tomero to answer the question because it is really within the Department now for decision.

Ms. TOMERO. Yeah, that is being considered now, and, again, will feed into our reviews.

Mr. WALTZ. The President has made the commitment, so I am curious as to what the holdup is within the Department. If it has been costed out, the relationship exists. The Commander-in-Chief has said we are going to do this. When do we expect this to free from the bowels of OSD?

Ms. TOMERO. Again, the Department is working through it, and we expect that this will be just as high a priority. It is being prioritized at the highest levels of the Department.

Mr. WALTZ. Weeks? Months? I don't know when the Israelis can expect another attack.

Ms. TOMERO. I will get back to you with an answer. I don't expect it will be months. Again, it is being—

Mr. WALTZ. Thank you.

Ms. TOMERO [continuing]. Prioritized at the highest level, and the Department is conducting meetings on it this week as we speak.

[The information referred to can be found in the Appendix on page 133.]

Mr. WALTZ. Thank you, Mr. Chairman.

Mr. COOPER. Mr. Panetta. This will be the last questioner.

Mr. PANETTA. Thank you, Mr. Chairman. I appreciate that.

Just quickly, Lieutenant General Shaw, how is SPACECOM integrating new roles as the global sensor monitor?

General SHAW. So, Congressman, I think what we are witnessing is a convergence of those mission sets that I mentioned in my opening remarks of space domain awareness, missile defense, and missile warning, meaning that as the threats diversify, the needs to track those at various stages all start to converge.

A ground-launched antisatellite weapon, an anti-sat weapon in space, and a hypersonic or a hyper glide vehicle, they all start to occupy the same kinds of timelines and needs. And so what we are doing in our role as global sensor manager, is finding ways that we can network together sensors against all of those threats at speed.

Mr. PANETTA. Great. Great. Thank you. And just one final question so Elise Stefanik can get a question in there. I see her on the

phone. One question though to deal with something that is important, near and dear to me, and that is the central coast and that is the Navy Postgraduate School [NPS]. How do you think other entities within the DOD enterprise like Navy Postgraduate School work with SPACECOM to develop new space-based educational requirements?

General SHAW. The programs I am already aware of at NPS are exceptional when it comes to space education. I think we would want to continue to be that part of our educational infrastructure.

Mr. PANETTA. Great. So do I. Look forward to working with you.

Mr. Chairman, I am going to yield back.

Mr. COOPER. Ms. Stefanik.

Ms. STEFANIK. Thank you so much, Chairman.

Thank you, Mr. Panetta. I just wanted to make sure they knew that I was here on the Republican side.

My question is simple: Section 1648 of the fiscal year 2021 NDAA required a report on a layered homeland defense system, which was to be submitted no later than March 1, 2021. We are obviously past that deadline. The report has yet to be delivered to Congress after numerous delays.

Admiral Hill, Congress is still awaiting this report on layered homeland missile defense required by the fiscal year 2021 NDAA. Has MDA provided all of its input for this report to the Pentagon?

Admiral HILL. Congresswoman Stefanik, the answer to that is, yes. It is really a policy question technically.

Ms. STEFANIK. Yes.

Admiral HILL. I see no barriers, but it is a policy question that we—

Ms. STEFANIK. Yeah, but I just wanted to get you on record, Admiral Hill.

Ms. Tomero, so we need this report to complete our work for the fiscal year 2022 NDAA. When will OSD submit this to Congress?

Ms. TOMERO. Let me get you a better answer on the timeline, but I can assure you that looking at what investments we make for layered homeland defense, what priorities are made are being—are the subject of studies, again, in consultation with the Missile Defense Agency, with the Office of Cost Assessment and Program Evaluation, CAPE, and so looking at what the options are, what the costs, some of it can be scaled, what can feed in to make improvements, and what can be done in terms of cost reduction.

And so we have made an initial investment on this in fiscal year 2021—I am sorry, in fiscal year 2022, and so those studies are going to inform further investments in fiscal year 2023, and so we will get you an answer on those studies.

Ms. STEFANIK. Great. That study is—it is not optional. That deadline is in law required by the fiscal year 2021 NDAA, so I will expect that answer from you and your office and OSD this week as to when we can expect that.

My next question is regarding the threats and how they have intensified. We know, according to open-source reporting, that North Korea has capabilities for striking anywhere in the U.S., and there is also open-source reporting that Iran and North Korea are working in tandem on missile development.

Additionally, open-source reporting talks about how the IRGC [Islamic Revolutionary Guard Corps] oversees Iran's civilian space launch program, which is obvious dual-use benefits and capabilities. Do you believe that the missile threats to the United States increased during and since the Obama administration?

And the reason why I go back to the Obama administration is, that administration said that we should build a third continental interceptor site if missile threats to the U.S. increased. So I want to know on record if you believe the threats to the homeland have increased since the Obama administration. That is for Ms. Tomero.

Ms. TOMERO. Yes, both North Korea and Iran are continuing to increase their missile capabilities and have increased them since 2010.

Ms. STEFANIK. And we know that the west coast has a more robust protection from missile threats from the Pacific. Relative to the west coast, is the east coast as protected from threats like a potential Iranian ICBM or an SLBM [sea-launched ballistic missile] from somewhere in the Atlantic?

Ms. TOMERO. Yes, all of the United States is protected with missile defense today.

Ms. STEFANIK. Switching gears to the NGI, there are reports that the MDA plans to buy 10 developmental interceptors as part of the NGI program. Would any of those interceptors go anywhere outside of the current GBI silo infrastructure sites at Fort Greely or Vandenberg Air Force Base? Specifically, could any of those interceptors go to an east coast missile defense site?

Ms. TOMERO. I will defer to Vice Admiral Hill on where interceptors could be placed.

Admiral HILL. Yeah, ma'am, right now we are focused on getting to the production numbers and those initial test articles. It will be a global force management discussion on, you know, anything beyond Fort Greely. But right now we are planning for Fort Greely. We have got the room there, Missile Field 4. We have all 20 silos installed now. We are doing the integration work. So we can house them in Fort Greely. And if the Nation makes the decision to open up battlespace by having a third site, that conversation will come.

Ms. STEFANIK. Okay. Thank you. I yield back.

Mr. COOPER. Mr. Kahele is recognized for 2 minutes.

Mr. KAHELE. Thank you, Mr. Chair.

My question is for the Homeland Defense Radar-Hawaii. I was disappointed to see that it was zeroed out in the President's budget, a program, a sensor that the previous combatant commander had quoted as saying the best program solution to enable a credible in-depth underlayer defense for our forces in Hawaii.

You know, in reviewing all the testimony, whether it is the Department's, the NORTHCOM commander, the MDA director, we all talk about North Korea, Kim Jong-un, and how increasing that threat is to the United States and the development of their ICBMs and nuclear missiles.

So my question is for Ms. Tomero. What is the Department of Defense's current plan to protect Hawaii and address the gap in our ability to detect, track, discriminate, and defeat a ballistic missile for Hawaii and for Guam?

Ms. TOMERO. Thank you, Congressman. I just want to make clear that Hawaii is currently protected today.

Mr. KAHELE. How is Hawaii protected?

Ms. TOMERO. It is protected with the current capabilities we have.

Mr. KAHELE. What sensor protects Hawaii?

Ms. TOMERO. Well, we have SBX [Sea-Based X Band Radar].

Mr. KAHELE. SBX is in the northern Pacific. What sensor protects the State of Hawaii from a ballistic missile threat from the DPRK?

Ms. TOMERO. Well, we have a network of sensors, including the tracking sensors, OPIR [Overhead Persistent Infrared satellite], and then, as I mentioned, we have SBX that contributes to improved discrimination. So it does—

Mr. KAHELE. If we need to use the SBX for Hawaii, then we are unable to use the SBX for the homeland, is that correct, for NORTHCOM?

Ms. TOMERO. I would defer to Vice Admiral Hill or General VanHerck on the details of the capabilities for—

Mr. KAHELE. I think the fact is—and I know we need to adjourn—is that we do not have an adequate sensor for the Hawaiian Islands. If we are going to depend on our Aegis systems, that is a capability that Admiral Aquilino cannot use in the Western Pacific.

If we are going to depend on SBX, that is a capability that NORTHCOM cannot use to defend the continental United States, and it is why we need a sensor in the Hawaiian Islands to defend against a ballistic missile threat from a rogue nation-state like the DPRK.

General VANHERCK. Congressman, I would like to talk from the NORTHCOM perspective, if you don't mind, about that. Even without SBX, I am confident in my ability to defend against a threat from DPRK to Hawaii today. I support the Hawaii radar. I believe it gives us additional capability for an underlayer that would support defense of Hawaii, specifically given additional capability and capacity. But let's be clear, at this moment in time, I am comfortable with my ability to defend Hawaii. That doesn't mean I don't support the sensor though.

Ms. TOMERO. I would add that we are looking at how to best improve the defense of Hawaii. The defense of Hawaii—

Mr. KAHELE. I suggest we look at both the defense of Hawaii and the defense of the territory of Guam as we shift to the Pacific.

Ms. TOMERO. Yes.

Mr. KAHELE. Thank you, Mr. Chair. I yield back.

Ms. TOMERO. Yeah, both of those—

Mr. COOPER. The gentleman's time is expired.

The subcommittee will be adjourned until about 5:00 or as soon as votes have ended, and we will meet in 2212 for the closed session. Thank you.

[Whereupon, at 4:35 p.m., the subcommittee proceeded in closed session.]

A P P E N D I X

JUNE 15, 2021

PREPARED STATEMENTS SUBMITTED FOR THE RECORD

JUNE 15, 2021

Opening Statement, Rep. Jim Cooper
Fiscal Year 2022 Budget Request for Missile Defense and
Missile Defeat Programs
June 15, 2021

Good afternoon. The subcommittee will come to order.

The purpose of today's hearing is to receive testimony on the 2022 budget request for missile defense and defeat programs.

Here today to testify are:

- Ms. Leonor Tomero, Deputy Assistant Secretary of Defense for Nuclear and Missile Defense Policy,
- General VanHerck, Commander of United States Northern Command and North American Aerospace Defense Command,
- Vice Admiral Hill, Director of the Missile Defense Agency,
- Lieutenant General Karbler, Commander of the United States Army Space and Missile Defense Command, and
- Lieutenant General John Shaw, Deputy Commander of the United States Space Command.

We have a breadth of experience at the table, and I thank you for participating in today's hearing.

In the Fiscal Year 2022 budget request this Administration continued efforts across the missile defense enterprise to improve U.S. missile defense capabilities. This Administration has properly funded the hypersonic and ballistic tracking space sensor – a top priority for our INDOPACOM, STRATCOM, and NORTHCOM commanders. I am concerned regarding the omission of the Homeland Defense Radar-Hawaii because we must ensure the entire United States gets maximum advance warning against threats from rogue nations like North Korea, which pursue ballistic missile technology.

While I am optimistic that the Pentagon and Missile Defense Agency are addressing the issues which lead to cancellation of the RKV program as they initiate the Next Generation Interceptor, this committee will focus on this program.

Lastly, I look forward to hearing from both Lieutenant General Karbler and Lieutenant General Shaw on how Space Command is affecting missile defense requirements and coordination, particularly when it comes to global sensor management.

Now, I turn to my Ranking Member, Mr. Turner for his remarks.

**NOT FOR PUBLICATION UNTIL RELEASED
BY THE SUBCOMMITTEE ON STRATEGIC FORCES
COMMITTEE ON ARMED FORCES
UNITED STATES SENATE**

**Statement of Ms. Leonor Tomero
Deputy Assistant Secretary of Defense for Nuclear and Missile Defense Policy
Before the
House Armed Services Committee Strategic Forces Subcommittee (HASC-SF)
On Missile Defense
June 15, 2021**

Introduction

Chairman Cooper, Ranking Member Turner, and distinguished Members of the Subcommittee, thank you for the opportunity to testify before you today on the missile threat environment and the Department's missile defense policy vision and priorities. It is an honor to appear beside General VanHerck, Lt Gen Shaw, LTG Karbler, and VADM Hill. I look forward to answering your questions.

This Committee's support for missile defense has been vital to the progress that U.S. and allied and partner missile defenses have made to address current and emerging missile threats from potential adversaries; and it will remain essential to support the Department's security commitments, as this Administration begins to formulate its defense policy.

The Consolidated Appropriations Act, 2021 demonstrated Congress's bi-partisan support for missile defense. Congress also supported key initiatives such as the integrated air and missile defense programs (IAMD) within the Military Departments and Services by continuing to fund enabling programs including the Army's integrated air and missile defense battle command system (IBCS), and the Navy's advanced IAMD-capable flight III destroyers. The resources requested maintain and extend the service lives of our current missile defense assets, promote readiness, increase capacity, reinforce deterrence and assurance missions, and enable us to invest in critical technologies needed to counter the growing spectrum of future missile threats.

Threat Environment

As missile technology matures and proliferates, the threat to the United States, allies, partners, and our deployed forces steadily grows. Potential adversaries continue to expand their

inventories and add new and increasingly sophisticated systems, often for the purpose of creating political instruments of regional or global coercion.

The Democratic People's Republic of Korea (DPRK) continues development and deployment of more capable intercontinental ballistic missiles (ICBMs) and submarine-launched ballistic missiles (SLBMs). The Office of the Director of National Intelligence (ODNI) suggests that the DPRK may resume ICBM testing to destabilize the security environment in East Asia, while seeking to drive a wedge between the United States and its allies.

Iran is extending the range, reliability, and accuracy of its missile forces at a concerning rate. Although Iran is not currently developing nuclear weapons, it has increased the size and enrichment level of its uranium stockpile, and has ignored restrictions on advanced centrifuge research and development. Even though it does not currently possess the capability to launch nuclear payloads at intercontinental ranges, Space Launch Vehicle (SLV) programs, such as the one that successfully placed a satellite in orbit in April 2020, develop similar technologies required for an ICBM capability, should they choose to pursue one.

The regional missile threat is also concerning as potential adversaries continue to field more accurate and lethal offensive missile systems capable of threatening the United States, allies, partners, and deployed forces.

The DPRK will pose an increasing threat to the United States, South Korea, and Japan as it continues to improve its missile force. During its January 2021 military parade, the DPRK unveiled a growing and more diverse ballistic missile force. Furthermore, recent testing demonstrates that Pyongyang continues its efforts to field more advanced and reliable short- and medium-range systems.

Iran's short- and medium-range ballistic missiles comprise the largest missile force in the Middle East, which it wields to threaten regional stability. The Office of the Director of National Intelligence (ODNI) assesses that Iran will take risks that could escalate tensions and threaten U.S. and allied interests in the coming year, using its missile forces as part of a range of tools to threaten military action and advance its goals.

Russia maintains one of the most numerous and sophisticated missile inventories in the world. Its regional anti-access area denial (A2/AD) strategies undergird broader strategic goals. The 2021 Annual Threat Assessment notes that Russia will continue to use its missile forces to undermine U.S. influence, reshape international norms, and divide our network of international alliances and partnerships.

In 2019, China launched more ballistic missiles than the rest of the world combined while also placing a heavy emphasis on testing hypersonic glide vehicles (HGV). Missile systems form the backbone of the PRC's anti access/area denial (A2/AD) strategy to inhibit U.S. power projection capabilities, coerce our allies and partners, and reshape the balance of power in the Indo-Pacific region.

Potential adversaries seek to defeat U.S. missile defenses not just through advances in offensive missile technology, but also through coercive diplomatic campaigns. We have repeatedly seen Russian and Chinese efforts to sow disinformation regarding U.S. missile defenses to threaten the strength of U.S. partnerships and of U.S. and allied forces; while simultaneously increasing their own homeland and regional missile defenses.

This evolving missile environment informs our missile defense efforts moving forward, which are part of a larger strategic framework to leverage all elements of national power to prevent and deter conflict, and to prevail should conflict occur.

Policy Framework for Upcoming Strategic Review

To address the evolving challenges to our security and the security of our allies and partners, the Department will review its missile defense policies, strategies, and capabilities to ensure they align with broader U.S. national security and national defense strategies. This review will be informed by several principles.

First, we will work to ensure we have an effective and affordable defense to address the rogue state ICBM threat to the United States. Missile defenses will provide protection of the United States from a limited attack from rogue actors. This protection will also contribute to diminishing the coercive potential of these states who may seek to constrain the ability of the

United States to provide credible security assurances to our allies and partners during a crisis or conflict.

Second, we will examine means to enhance our regional posture to support our allies and partners and to defend deployed forces abroad. Our regional missile defenses will continue to contribute to the United States' ability to operate throughout the world. They will enable regional and trans-regional military operations and exercises, providing force protection in contested environments.

Third, missile defense will remain an important component of our strategy to assure U.S. allies and partners that we stand firm in our security commitments. Not only will missile defense partnerships reinforce the indivisibility of U.S. and allied joint security interests, these relationships will also provide opportunities for allied and partner cooperation, co-development, and burden sharing.

Lastly, as Secretary Austin stated, the Department must maintain credible deterrence against advanced threats, and right-size our missions around the world in a transparent and principled manner. Therefore, we must carefully align the scope of our missile defense programs with operational requirements, and clearly communicate their intent to help avoid miscalculation.

In this context, the Department will examine the appropriate mix of capabilities and tools to protect our forces, deter our adversaries, and address future uncertainty while strengthening strategic stability, and reducing risks of miscalculation.

Homeland Defense

The United States is strengthening its homeland defenses and is pursuing more advanced capabilities over the long term. As Secretary Austin has noted, defending the Nation is a key priority for DoD, and missile defense against rogue state threats is a central component of this mission.

The United States is currently defended from rogue state ICBM threats by the Ground-Based Midcourse Defense (GMD) system with Ground Based Interceptors located at Fort Greely, Alaska, and Vandenberg Air Force base, California. The threat is not static and neither is our commitment to improving the defense of the nation. To that end, the Department recently

initiated the development of the Next Generation Interceptor (NGI) in order to augment and potentially replace the current GMD interceptors and increase the overall reliability and capability of the GMD system when it begins deployment in late FY2028. The FY 2022 budget includes \$926 million to support NGI development and program risk reduction. As this program moves forward, it will do so in a manner that aligns with the Administration's defense goals and priorities. The Department is also executing the Ground-Based Interceptor (GBI) Service Life Extension Program, which will ensure reliable defense from rogue state threats while we develop NGI to improve current GMD capabilities.

Any future decision to augment the missile defense of the United States, will ensure the overall homeland missile defense posture is sized to provide effective protection of the United States against a limited rogue state ballistic missile attack. As part of our upcoming strategic reviews and consistent with direction in National Defense Authorization Act for Fiscal Year 2020 Congressional direction, the Department will examine potential options and concepts for strengthening the defense of the United States. It is important to note that the U.S. continues to rely on nuclear deterrence to protect against the more sophisticated and numerically large Russian and Chinese intercontinental missile threats.

Additionally, DoD will continue to look across our ballistic missile defense capabilities in order to seek synergies with the cruise missile defense (CMD) mission, and maximize investment. Policy and NORTHCOM/NORAD are working across the Department to ensure the United States is appropriately examining potential approaches to our CMD posture and capabilities.

Another vital component of effective U.S. and regional defense, which Secretary Austin has noted, will be to enhance our global network of integrated sensors. Space-based and land-based sensors enable a variety of capabilities such as detection, tracking, and targeting through all phases of flight for an incoming missile. As the rogue threat evolves in capability, discrimination remains key to enhancing the performance of the GMD system. For this reason the Department is requesting an additional \$133 million to support the initial fielding of the Long Range Discrimination Radar in Clear, Alaska later this year; with operational acceptance in FY 2023. As we look to space, integrating the Space-based Kill Assessment capability into our missile defense architecture and exploring advanced proliferated low earth orbit space sensor

development, in particular, will be critical for the future of homeland and regional missile defeat and defense programs.

Regional Defense

This Administration's Interim National Security Strategic Guidance affirms that "Regional actors ... continue to pursue game-changing capabilities and technologies, while threatening U.S. allies and partners and challenging regional stability." It is critical that we maintain support for regional missile defense systems to address missile threats and the A2/AD strategies of potential adversaries. The Interim Strategy goes on to say that "despite these steep challenges, the United States' enduring advantages—across all forms and dimensions of our power—enable us to shape the future of international politics to advance our interests and values, and create a freer, safer, and more prosperous world." Missile defenses will remain central to maintaining the U.S. enduring advantage to flow forces into a militarily contested regional environment, and to safeguard those forces should a conflict arise.

Over the past decade, the United States has made progress in developing capabilities for protection against regional missile threats. The Department plans to explore new regional capabilities and upgrade current regional systems such as Patriot, Terminal High Altitude Area Defense (THAAD), and the SM-3 interceptors to maximize their interoperability and the defended battlespace. It is also important to increase the capacity of our regional systems to maintain credible and capable war-fighting capabilities. For this reason, the Department supports: \$295 million for SM-3 Block IIA procurement, \$352 million for SM-3 Block IB interceptors, procuring additional SM-6 interceptors, the continued development and eventual procurement of Patriot Missile Segment Enhancement (MSE) interceptors, and increasing the capacity of regionally deployed THAAD systems.

The Department will continue to ensure that we bring a more integrated approach to air and missile defense (IAMD) that not only assists with defense against various types of ballistic missile threats but also enables other regional missions, such as defense against cruise missiles and unmanned aerial systems. Thus, U.S. geographic Combatant Commands, are developing IAMD initiatives that will inform future missile defense operational architectures and cooperation strategies with allies and partners. The objective of these efforts is to field

interoperable and integrated missile defense sensors, interceptors, and command and control - capable against a range of threats and tailored to their unique operating environments.

A testbed for our IAMD development path will be the missile defense of Guam. China's A2/AD capabilities increasingly threaten to erode the U.S. ability to ensure its presence in the Western Pacific and reinforce allies and partners in the region. The Department is examining the ways in which it can ensure the effective defense of Guam from various missile threats. Survivable, scalable, and affordable IAMD, in combination with offensive capabilities and passive defense measures, provide the means to strengthen deterrence and, if deterrence fails, limit disruption to U.S. regional military operations. Lastly, as Secretary Austin stated regarding capable regional threats, "we will... guarantee freedom of action in contested, complex operating environments... while using all of our tools to lower the risk of escalation with our adversaries."

Advanced Technology

In addition to improving today's operational systems, we are examining advanced concepts and technologies. Our investment strategy and priorities will focus on how best to address more advanced adversary missile threats, especially those being designed to complicate our current regional missile defense architectures.

For example, in FY22 we will continue to develop the prototype Hypersonic and Ballistic Tracking Space Sensor (HBTSS). This is a priority for the Department to be able eventually to assist with fire control for regional defense, and also for hypersonic missile warning and attribution, in general. This demonstration will be an important step towards building the capability and resiliency of our space sensor architecture.

As part of our future hypersonic defense architecture, the Department will also request funds to support a future regional Glide Phase Intercept demonstration capability. Our approach for regional hypersonic defense is to initially focus on terminal phase defense.

Another concept being explored for its utility to the IAMD terminal defense mission is directed energy. The Department is analyzing various directed energy concepts and their application as a complement to existing missile defense systems.

Central to any future battlefield will be information superiority to enable rapid planning and employment in a joint operating environment. To that end, the Department is developing various cyber-hardened, advanced all domain awareness command and control architectures that will enable timely and accurate decision-making to address emergent threats and coordinate responses. These developmental systems will greatly enable the “any sensor, best shooter” concept that is foundational to effective IAMD.

Cooperation with Allies and Partners

Working closely with key allies and partners in Europe, the Middle East, and the Indo-Pacific region to enhance our collective security is key priority for this Administration. To that end, engaging and working with our allies and partners to enhance our collective missile defense efforts is a core focus area for the Department. The Indo-Pacific is one of the most important regions of the world, and is a model for cooperative missile defense efforts with strong allies such as Japan, the Republic of Korea, and Australia. The Department will continue to work with Japan to enhance its fleet of missile defense assets as Japan works towards its next generation of maritime defense. The United States has recently completed upgrading the Republic of Korea’s (ROK) Patriot batteries and looks forward to shared analysis for enhancing the ROK’s and Korean-based U.S. forces’ layered defenses against threats from DPRK. Our working groups, interoperability initiatives, and hosting of U.S. missile defense systems help to maintain our regional security presence.

NATO continues to form the backbone of European joint and combined operations. A few highlights for missile defense include Aegis Ashore Poland, which will soon join Romania in providing defense against the potential Iranian missile threat; and the procurement of Patriot units and the European-produced SAMP-T (Surface-to-Air Missile Platform/Terrain), by several countries. Allies such as Germany and the United Kingdom are developing their own organic systems, while the U.S., through MDA, continues to execute a range of research and development initiatives with our NATO partners. The Department is also pursuing the advancement of IAMD interoperability through the Formidable Shield exercise series. These efforts will provide important tools and capabilities in dealing with regional missile challenges intended to undermine or weaken the NATO Alliances ability to respond to aggression.

In the Middle East, U.S.-Israeli missile defense collaboration is at the cutting edge of missile defense technology and serves as evidence of the mutual benefits of technology sharing with our allies and partners. Our annual contribution to Israel of \$500 million continues our longstanding bilateral cooperation on missile defense. We will continue to explore applications for the very capable Israeli missile defense systems across the region and beyond. With our other allies and partners in the region, the Department's efforts center on bilateral cooperation with key Gulf Cooperation Council (GCC) countries. For example, the United Arab Emirates, Qatar, and Saudi Arabia have purchased a mix of U.S. THAAD and/or Patriot batteries and radars. Multilaterally, the Department will continue to work with our GCC partners to foster a more integrated approach to regional missile defense cooperation.

Additionally, DoD participates in a series of bilateral, trilateral, quadrilateral, and multilateral dialogues that share information on regional and global missile threats, exchange operational IAMD visions, discuss modernization efforts and future capability development, and seek new opportunities for joint research, training, and co-production/co-development. From a strategic standpoint, and as Deputy Secretary Hicks testified, cooperation in this area strengthens our common protection, enhances deterrence, and provides assurances essential to the cohesion of our alliances in the face of growing regional missile threats, coercion, and attacks. Operationally, by developing a more coordinated, and where possible, integrated approach to air and missile defense, we will improve our ability to work with allies and partners to address adversary A2/AD strategies and capabilities collectively.

Conclusion

As the Department prepares for its strategic review, I assure members of this committee that it will remain committed to key missile defense missions and priorities. In today's complex operating environments we must be prepared to meet the risks and danger from missile threats together as allies and partners. Lastly, in an emerging multi-domain battlefield, it will be critical to invest in effective missile defense technologies in a responsible, cost-effective manner that maintains regional and strategic stability and reliably retains U.S. advantage long into the future.

Leonor Tomero
Deputy Assistant Secretary of Defense for Nuclear and Missile Defense

As of January 20, 2021, Leonor Tomero serves as the Deputy Assistant Secretary of Defense for Nuclear and Missile Defense Policy in the Office of the Secretary of Defense, supporting the Under Secretary of Defense for Policy and the Assistant Secretary of Defense for Strategy, Plans, and Capabilities by developing strategies, informing policies, and conducting oversight of nuclear deterrence policy, arms control and missile defense policy.

For over a decade, she was House Armed Services Committee Democratic professional staff lead for nuclear deterrence, nuclear weapons, nonproliferation, military space, and missile defense. In that capacity, she had responsibility for drafting and negotiating over 100 provisions and authorizing over \$65 billion each year in eleven annual National Defense Authorization Acts, with regard to military space and related intelligence assets, nuclear forces and production capacity, hypersonic missiles, missile defense, non-proliferation, arms control, and nuclear clean-up programs.

Prior to joining the Committee, she was Director of Nuclear Non-Proliferation at the Center for Arms Control and Nonproliferation, responsible for analysis, Congressional education, Track II programs, and public and media outreach related to nuclear weapons, nonproliferation, missile defense and space policy. She also served on the congressional staffs of Rep. Shelley Berkley (D-NV) and Senator Harry Reid (D-NV) working on nuclear waste and environmental issues.

Ms. Tomero holds a B.A. in Government from Cornell University, an M.A. in Security Studies from Georgetown University and a J.D. cum laude from American University's Washington College of Law, and was a term-member on the Council on Foreign Relations.

**STATEMENT OF
GENERAL GLEN D. VANHERCK, UNITED STATES AIR FORCE
COMMANDER
UNITED STATES NORTHERN COMMAND
AND
NORTH AMERICAN AEROSPACE DEFENSE COMMAND**



**BEFORE THE
HOUSE ARMED SERVICES COMMITTEE
SUBCOMMITTEE ON STRATEGIC FORCES**

15 JUNE 2021

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Chairman Cooper, Ranking Member Turner, and distinguished members of the Committee: Thank you for the opportunity to testify, and for allowing me the honor of representing the Soldiers, Sailors, Airmen, Marines, Guardians, Coast Guardsmen, and civilians of United States Northern Command (USNORTHCOM) and North American Aerospace Defense Command (NORAD), including the members of the Canadian Armed Forces who are a vital and essential part of the NORAD team.

Since I assumed command of USNORTHCOM and NORAD, each day has afforded me the opportunity to lead a workforce of dedicated, innovative, and resilient warfighters and public servants. That fundamental commitment to our vital missions is clearly evident as USNORTHCOM and NORAD have kept the watch and defended our nations in what is certainly the most dynamic and complex strategic environment I have encountered in my 33 years in uniform.

Our competitors continue to take increasingly aggressive steps to gain the upper hand in the military, information, economic, and diplomatic arenas. USNORTHCOM meets each of those challenges head-on—and we have done so while supporting whole-of-government efforts to safeguard our citizens through the coronavirus pandemic and historically severe hurricane and wildfire seasons, and also simultaneously synchronizing the deployment of troops to support federal law enforcement personnel on the southwest border. The cascading events of the past year placed unprecedented strain on our people, our interagency partners, and our institutions, and I am proud that we overcame each of those challenges and emerged more resilient.

That steadfast commitment is more important than ever as our competitors continue to challenge our homelands through multiple means in all domains. Defending our nations, our citizens, and our way of life requires constant vigilance, and USNORTHCOM and NORAD have

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demonstrated time and again that our commands remain determined, focused, and ready. But we must keep moving forward. Looking to the future, we will continue to pursue innovative capabilities and strategies to detect, deny, deter, and, if necessary, defeat potential threats posed by peer competitors, rogue nations, transnational criminal organizations, and foreign and domestic violent extremists. No matter the challenge or circumstance, this Committee should rest assured USNORTHCOM and NORAD are always on guard.

Threats

The global geostrategic environment continues to rapidly evolve. While the United States has spent the last 30 years projecting power forward to combat rogue regimes and violent extremists overseas, our competitors pursued capabilities to circumvent our legacy warning and defensive systems and hold our homeland at risk. Peer competitors like Russia and China are undermining the international rules-based order and challenging us in all domains. Further, rogue states like North Korea and Iran are also pursuing capabilities to nullify our military advantages, threaten our networks with cyber weapons, and—in the case of North Korea—develop nuclear weapons. Meanwhile, violent extremist organizations continue to devise plots to attack our citizens and our way of life.

During the Cold War, we were overwhelmingly focused on defending the United States and Canada from a single nation-state threat. After the Soviet collapse, Iraq's invasion of Kuwait, and later the attacks on September 11, 2001 we shifted our focus to non-state and rogue actors. Today, we don't have the luxury of focusing regionally or on only one threat at a time. In the last decade, we've seen a sharp resurgence in the nation-state threat as our global competitors deploy increasingly sophisticated capabilities to hold the United States and Canada at risk and limit our options in a crisis. Concurrently, the terrorist threat continues to evolve in

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ways that challenge our homeland defense capabilities. As a result, today's threat environment is likely the most complex we have ever faced, as potential adversaries threaten us in all domains and from all vectors.

Russia

Russia presents a persistent, proximate threat to the United States and Canada and remains the most acute challenge to our homeland defense mission. Russian leaders seek to erode our influence, assert their regional dominance, and reclaim their status as a global power through a whole-of-government strategy that includes information operations, deception, economic coercion, and the threat of military force.

In peacetime, Russian actors conduct sophisticated influence operations to fan flames of discord in the United States and undermine faith in our democratic institutions. In crisis or conflict, we should expect Russia to employ its broad range of advanced capabilities—non-kinetic, conventional, and potentially nuclear—to threaten our critical infrastructure in an attempt to limit our ability to project forces and to attempt to compel de-escalation. Offensive capabilities Russia has fielded over the last several years include advanced cyber and counterspace weapons and a new generation of long-range and highly precise land-attack cruise missiles—including hypersonics. These capabilities complicate our ability to detect and defend against an inbound attack from the air, sea, and even those originating from Russian soil.

Russia also continues to modernize all three legs of its nuclear triad. In December 2019, Russia fielded the world's first two intercontinental ballistic missiles (ICBMs) equipped with a hypersonic glide vehicle payload that will challenge our ability to provide actionable warning and attack assessment. In the coming years, Russia hopes to field a series of even more advanced weapons intended to ensure its ability to deliver nuclear weapons to the United States.

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These include the Poseidon transoceanic nuclear torpedo and the Burevestnik nuclear-powered cruise missile, which—if perfected—could enable strikes from virtually any vector due to its extreme range and endurance.

Finally, Russia continues to conduct frequent military operations in the approaches to North America. Last year, NORAD responded to more Russian military flights off the coast of Alaska than we've seen in any year since the end of the Cold War. These Russian military operations include multiple flights of heavy bombers, anti-submarine aircraft, and intelligence collection platforms near Alaska. These efforts show both Russia's military reach and how they rehearse potential strikes on our homeland. Last summer, the Russian Navy focused its annual OCEAN SHIELD exercise on the defense of Russia's maritime approaches in the Arctic and Pacific. The multi-fleet exercise, intended in part to demonstrate Russia's ability to control access to the Arctic through the Bering Strait, included amphibious landings on the Chukotka Peninsula opposite Alaska, as well as anti-submarine patrols and anti-ship cruise missile launches from within the U.S. Exclusive Economic Zone.

China

China continues to pursue an aggressive geopolitical strategy that seeks to undermine U.S. influence around the globe and shape the international environment to its advantage. In the USNORTHCOM area of responsibility, China has made deliberate attempts to increase its economic and political influence with our close partners in Mexico and The Bahamas. While the United States remains the economic and military partner of choice in the region, China is seeking to grow its trade and investment in Mexico and, over the past few years, has invested in The Bahamas' vital tourism sector through marquee infrastructure projects. Militarily, China is rapidly advancing a modernization program that seeks to erode our military advantages and deter

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us from intervening in a regional conflict.

China remains among the world's most capable and brazen cyber actors, stealing volumes of sensitive data from U.S. government, military, academic, cleared defense contractors, and other commercial networks each year. In a crisis, China is postured to transition rapidly from cyber exploitation to cyber attack in an attempt to frustrate our ability to flow forces across the Pacific, and globally. China also continues to advance its counter-space capabilities that could threaten our space-based communications and sensors. In the foreseeable future, China will likely be able to augment its cyber-attack capabilities with a new family of long-range precision-strike weapons capable of targeting key logistical nodes on our West Coast that support U.S. mobilization and sustainment.

China also continues to expand and modernize its strategic nuclear forces to rival those of Russia and the United States in sophistication, if not in numbers. Over the last decade, China fielded dozens of road-mobile ICBMs and several ballistic missile submarines designed to enhance the survivability of China's nuclear deterrent and ensure its ability to retaliate following any attack. In the next decade, China will deploy a new generation of advanced weapons—some of them hypersonic—that will further diversify their nuclear strike options and potentially increase the risks associated with U.S. intervention in a contingency.

North Korea and Iran

The Kim Jong Un regime has achieved alarming success in its quest to demonstrate the capability to threaten the U.S. homeland with nuclear-armed ICBMs, believing such weapons are necessary to deter U.S. military action and ensure his regime's survival. In 2017, North Korea successfully tested a thermonuclear device—increasing the destructive potential of their strategic weapons by an order of magnitude—as well as three ICBMs capable of ranging the United

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States. In October 2020, North Korea unveiled a new ICBM considerably larger and presumably more capable than the systems they tested in 2017, further increasing the threat posed to our homeland. The North Korean regime has also indicated that it is no longer bound by the unilateral nuclear and ICBM testing moratorium announced in 2018, suggesting that Kim Jong Un may begin flight testing an improved ICBM design in the near future.

Iran continues to advance its military technologies and threaten the security of U.S. forces and allies throughout the Middle East. Iran adheres to a self-imposed range limit on its ballistic missile force that prevents it from directly threatening the United States. Nonetheless, Iran is developing and testing ICBM-relevant technologies through its theater missiles and space launch platforms—including its first successful orbit of a military satellite in April of 2020—that could accelerate the development of a homeland-threatening ICBM should Iran's leaders choose to pursue such a system. Iran retains the ability to conduct attacks via covert operations, terrorist proxies, and its growing cyber-attack capabilities, which it has already employed against U.S. financial institutions.

Defending the Homeland

USNORTHCOM's defense of the homeland provides the foundation for the full spectrum of the Department of Defense's worldwide missions and supports the missions of every other combatant command. The ability to deploy forces overseas, support allies, deliver humanitarian assistance, and provide presence and reassurance around the globe relies on our ability to safeguard our citizens, as well as national critical infrastructure, transportation nodes, and leadership. As competitors field highly advanced and agile long-range weapons systems and seek to act on growing territorial ambitions, we are adapting our thinking, evolving our own capabilities, and enhancing our operations and exercises to accurately reflect a changing world while remaining a relevant force.

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The United States has long relied on our nuclear arsenal to serve as the strategic deterrent against an attack on our homeland. In today's threat environment, strategic deterrence remains foundational to our national defense. A safe, secure, and effective nuclear force remains the most credible combination of capabilities to deter strategic attack and execute our national strategy. The U.S. strategic deterrent has helped to maintain a careful balance between nuclear powers and remains the bedrock of our national defense, as the longstanding doctrine of deterrence by punishment makes clear to potential adversaries that a large-scale attack on the United States or our allies would result in an overwhelming and devastating response.

However, over the last decade, our competitors have adapted new techniques and fielded advanced weapons systems with the potential to threaten the homeland below the nuclear threshold. Simply stated, the missiles and delivery platforms now in the hands of our competitors present a significant challenge to our legacy warning and assessment systems and defensive capabilities. Advanced systems posing threats to the homeland have already been fielded in large numbers, and our defensive capabilities have not kept pace with the threat. The notion that the homeland is not a sanctuary has been true for some time, and that will remain the case for the foreseeable future. Therefore, we must ensure effective nuclear and conventional deterrents are in place to defend the homeland and ensure our ability to project power where and when it is needed.

Highly advanced cruise missiles, hypersonic missiles, and stealthy delivery platforms provide our competitors with the ability to hold targets in the homeland at risk with conventional weapons. That fact has led us to emphasize improved all-domain awareness and the development of a layered sensing grid to provide warfighters and decision makers at the strategic, operational, and tactical levels with increased awareness and decision space.

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The reality of a vulnerable homeland and the risks associated with rising global competition are driving our commands to collaborate with interagency and industry partners to find and deliver smarter, more affordable technology. To outpace our competitors, we cannot be satisfied with incremental steps; instead, we must continue to increase the pace and tempo of our technological advancements. This work is essential, and we are proud of our close collaboration with a host of interagency and industry partners and international allies as we work together to outthink our competition, outpace threats, and defend what we hold most dear. That global focus and cooperation is also reflected in our growing wargaming capacity, including major homeland defense exercises such as VIGILANT SHIELD and our participation in the Large Scale Global Exercise series.

The Path to Decision Superiority

I believe our future success in USNORTHCOM, our fellow U.S. combatant commands, and NORAD requires **all-domain awareness, information dominance, and decision superiority**. Our competitors have invested heavily in weapons systems that can be launched against distant targets with little to no warning, as well as stealthy delivery platforms specifically designed to evade detection by existing sensors. As a result, the successful execution of USNORTHCOM and NORAD missions in the digital age relies on significantly improving global **all-domain awareness** through the development of a fused ecosystem of networked sensors extending from space to the seafloor.

This network will pull data from an array of repurposed systems, legacy sensors enhanced through low-cost software modifications, and a limited number of new sensors to provide robust indications and warning and persistent tracking of the full spectrum of potential threats to the homeland from the seafloor to on orbit. Integrating and sharing data from this

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global sensor network into common platforms will allow leaders to observe potential adversaries' actions earlier in the decision cycle, providing more time and decision space at all levels.

That decision space is where the true value of improved domain awareness resides. Harnessing the capability of distributed multi-domain sensors, machine learning, and artificial intelligence will provide military leaders, the intelligence community, and senior civilian officials with the information necessary to anticipate, rather than react to, competitors' actions.

All-domain awareness is the first critical step on the path to **decision superiority**, and USNORTHCOM and NORAD require and have prioritized capabilities that improve our domain awareness and global integration with our fellow warfighters. Sensors and systems such as Over the Horizon Radars, polar satellite communications, Integrated Underwater Sensor Systems, and space-based missile warning and tracking sensors are essential to our missions. And while the benefits to continental defense are clear, these capabilities will also help every U.S. combatant commander around the world while enhancing USNORTHCOM and NORAD's collective ability to defend the United States and Canada.

In September 2020, just after I assumed command of USNORTHCOM and NORAD, the commands partnered with the United States Air Force and United States Space Command in the second onramp demonstration of the Air Force's Advanced Battle Management System (ABMS). This large-scale joint force demonstration established a network with embedded machine learning and artificial intelligence to rapidly detect, track, and positively identify a simulated cruise missile threat, while providing a common operating picture and all-domain awareness for commanders at multiple levels.

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The ABMS onramp demonstration provided a brief but exciting glimpse into the future of USNORTHCOM and NORAD. By creating potential pathways for accessing and distributing data in ways that allow leaders to think, plan, and act globally rather than relying on outdated regional approaches, we are significantly amplifying the capability of the joint force. Through these and other efforts, USNORTHCOM and NORAD are actively working to deliver **information dominance** by fusing new technologies to increase decision space for commanders and senior civilian decision makers. Ultimately, our objective is to enable leaders and commanders all over the world to quickly assess any situation and take the steps necessary to stay well ahead of an adversary's next moves in order to deter and deny in competition, de-escalate in crisis, and defeat in conflict.

In March of this year, USNORTHCOM and NORAD led a Global Information Dominance Experiment (GIDE) that brought leaders from all 11 combatant commands together in one collaborative environment. GIDE demonstrated the strategic value of Joint All-Domain Command and Control by allowing combatant commands to rapidly share information across all domains and collaborate in near real-time. During this experiment, which included a NORAD live-fly exercise, we worked with industry partners to fuse all-domain sensing within a common data system in order to develop globally integrated courses of action and advance the Joint Force's **information dominance** capability. This experiment demonstrated the power of artificial intelligence and machine learning tools, which have the ability to expand decision space for decision makers. Through GIDE events, we will continue to test these capabilities, improve global integration, and help the DoD and allies increase **all-domain awareness** to enable **information dominance**—and ultimately achieve **decision superiority**.

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The prototype Pathfinder data analytics project provides another example of how USNORTHCOM and NORAD are working to leverage existing but stovepiped data streams to the benefit of both operational and strategic decision makers. In our ongoing prototype efforts, Pathfinder gathers data from multiple distinct military and civilian air domain sensors and, through automation and machine learning models, produces a fused common operating picture to improve the reliability of the data and increase the decision space that will someday soon be available in real time to our assessors and watch-standers. This low-cost, rapidly developed system will have long-term benefits for our domain awareness and has already shown some of the advantages that information dominance will provide to warfighters around the world.

Information is power, but only if it is accessible, sharable, and actionable. Unlocking the enormous potential of the data currently being collected by a global layered sensor grid will allow us to gain a decisive advantage over competitors and potential adversaries. Currently, vast quantities of data are trapped by incompatible systems and antiquated organizational structures. Breaking down these stovepipes is achievable, but doing so will require innovation and coordination across various agencies, to include technology that allows for timely exploitation of the massive volume of data collected by our sensor networks. More importantly, it will also depend on breaking away from a culture that favors compartmenting and isolating information, in order to fully realize the full potential of our capabilities—including those that reside with our allies and partners. As the defense and intelligence communities connect systems and sensors, consideration of national electromagnetic spectrum management policies is needed to ensure that necessary connections and bandwidth are accessible.

As our competitors rapidly develop and deploy advanced capabilities with clear intent to overcome the U.S. technological advantage, the Department of Defense and the U.S.

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Government as a whole must also modernize our requirements and acquisition processes to stay ahead. Given the current pace of technological advancement, we must take full advantage of the forward-thinking solutions our industry partners can offer. To succeed in this era of Great Power Competition, it is essential to rapidly deliver capabilities to the warfighter by streamlining the processes for prototyping, testing, and moving promising technologies into production.

The success of USNORTHCOM and NORAD's Pathfinder program, along with much of the work done by DOD's Defense Innovation Unit, show what is possible when we provide innovators and technical experts the resources and flexibility to tackle even the most daunting challenges. The same approach should also be applied to software development and acquisition. Success in competition and in conflict will increasingly depend on the ability to field software-based capabilities faster than our adversaries. For that reason, I am encouraged by the new model championed by the Office of the Under Secretary of Defense for Acquisition and Sustainment that will enable the Department of Defense to acquire software through modern development practices and deliver needed capability at the speed of relevance.

Armed with timely and accurate information, equipped with modern sensors and software, and backed by a flexible and responsive conventional deterrent that provides defeat mechanisms below the nuclear threshold, commanders and senior civilian leaders will achieve **decision superiority** with the options and time necessary to allocate resources wherever needed to deny or deter aggression in competition, de-escalate potential crises, and defeat adversaries should conflict arise.

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Missile Defense**Ballistic Missile Defense**

The need for a robust and modern ballistic missile defense system has been strongly reinforced over the past year. Despite U.S. efforts in 2020 to reach an agreement with Kim Jong Un, North Korea continued its development of ICBMs capable of striking targets in the United States. As North Korea continues its pursuit of advanced long-range strategic weapons—including the new systems displayed during their 10 October 2020 parade—USNORTHCOM remains committed to maximizing the capability and capacity of our ballistic missile defense systems.

USNORTHCOM is focused on developing and fielding advanced sensors capable of tracking potential missile threats and providing improved discrimination capability to our warfighters and assessors. Simultaneously, USNORTHCOM is collaborating with our partners in the Missile Defense Agency (MDA) to ensure that the Next Generation Interceptor (NGI) is fielded and operational as soon as possible. Of note, USNORTHCOM worked hand-in-hand with MDA to ensure all of our operational requirements are addressed in the NGI acquisition process. When fielded, NGI will add 20 interceptors to the current inventory, and will provide greater reliability and capability.

As competitor missile technology advances, USNORTHCOM is also working with MDA toward a layered missile defense capability that will allow for a more flexible and responsive defense of the homeland against both ballistic missile and cruise missile threats. The successful engagement of an ICBM-class target by an SM3-IIA interceptor on 16 November 2020 was an historic achievement and a critical step toward establishing this layered capability. Defending the United States homeland against the ballistic missile threat remains a complex and technically

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challenging endeavor, and I am grateful to the Committee for your continued support as we take the steps necessary to ensure the success of this critical mission.

Cruise Missile Defense

As evidence of both the global nature of the threat and the implicit trust in our bi-national command, NORAD is developing the requirements for the defense of the United States and Canada against advanced cruise missiles. In this capacity, NORAD works closely with the U.S. military Services, the Canadian Joint Operations Command, and a host of other dedicated DoD and Canadian Defence Ministry partners to share costs and ensure a clear, common understanding of the threat and what will be required to mitigate the risk to our nations.

Modern cruise missiles are difficult to detect and can be launched from significant distances against targets in the United States and Canada from launch sites on Russian soil and by long-range bombers, attack submarines, and surface vessels. Whether subsonic or hypersonic, these missiles can range targets in the homeland and present a very real challenge for our defensive capabilities. Russia has already amassed an inventory of both nuclear and conventional variants, while China is expected to develop similar capabilities in the next decade.

The proliferation of these systems creates all the more incentive for focused investments in improved sensor networks, domain awareness, and information dominance capabilities. Those investments, coupled with the development of layered denial, deterrence, and defeat mechanisms capable of addressing current and emerging threats, are fundamental to the defense of our homeland.

Conclusion

As USNORTHCOM and NORAD look to a future marked by rapid shifts in the geopolitical environment and technological advancement, we are guided by the lessons of the

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past. Key among those is that we cannot overcome challenges in isolation. By viewing changing conditions and competitor actions from a global perspective, our problems become more solvable and the solutions more affordable. USNORTHCOM and NORAD will continue to build our partnerships, collaborate with fellow warfighters, and work toward overcoming shared problems rather than continuing to focus on point solutions to isolated threats.

To that end, I look forward to working with the Committee and with all of our innovative industry and interagency partners as we move quickly to develop and field the capabilities required to defend our nations now and well into the future. Together, I believe we can eliminate outdated barriers that only serve to stifle information sharing, and simultaneously foster a mindset that favors creative, forward-looking approaches over unproductive reliance on legacy systems and processes.

Finally, and perhaps most importantly, we will continue to prioritize our most vital asset: our people. With that in mind, I would like to take this opportunity to publicly recognize the select group of USNORTHCOM and NORAD personnel responsible for standing the operational watch 24 hours a day, every day. Their mission is crucial to our defense, and these military and civilian watch-standers have spent much of the last year under strict but necessary isolation protocols to mitigate the risk of a COVID outbreak. They and their families have endured long periods of separation during an already difficult time, and they have done so without any expectation of public recognition. I am honored to lead men and women of such selflessness and professionalism, and our citizens should rest assured these extraordinary defenders have the watch.

General Glen D. VanHerck

Gen. Glen D. VanHerck is Commander, United States Northern Command and North American Aerospace Defense Command. USNORTHCOM conducts homeland defense, civil support and security cooperation to defend and secure the United States and its interests. NORAD conducts aerospace warning, aerospace control and maritime warning in the defense of North America.

Gen. VanHerck is a graduate of the University of Missouri and commissioned through the Reserve Officer Training Corps program. He has a diverse background that includes operational and training assignments in the F-15C Eagle, F-35A Lighting II, B-2A Spirit and B-1B Lancer aircraft. He has served as an instructor pilot and flight examiner in the F-15C, B-2A and T-6A Texan II. Additionally, he served as a U.S. Air Force Weapons School instructor in the F-15C and the B-2A.

He has commanded at the squadron, group and twice at the wing level, including the 325th Weapons Squadron, the 71st Operations Group, the 7th Bomb Wing, the 509th Bomb Wing. As a major general, he commanded the U.S. Air Force Warfare Center. His staff assignments include tours as the Chief of the B-2 Program Element Monitor at Headquarters Air Combat Command, the Director of Operations at Headquarters Air Force Global Strike Command, the Director of Plans and Integration at U.S. Strategic Command, the Vice Director of Strategy, Plans and Policy (J5) at the Joint Staff, and the Vice Director of the Joint Staff.

Prior to his current assignment, Gen. Glen D. VanHerck was the Director, Joint Staff, the Pentagon, Arlington, Virginia. In this role, he assisted the Chairman of the Joint Chiefs of Staff in his role as advisor to the President and Secretary of Defense, coordinated and directed the activities of the Joint Staff in support of the Chairman and served as the Staff Inspector General.

EDUCATION

1987 Bachelor of Science, Liberal Studies, University of Missouri, Columbia
 1995 Squadron Officers School, Air University, Maxwell Air Force Base, Ala.
 1999 Air Command and Staff College, Maxwell AFB, Ala., by correspondence
 2000 Master of Science, Aviation Safety/Management, University of Central Missouri, Warrensburg
 2005 Air War College, Air University, Maxwell AFB, Ala., by correspondence
 2008 Master of Arts, National Security and Strategy, Naval War College, Newport Naval Station, R.I.
 2008 Naval War College, Newport, R.I.
 2009 U.S. Air Force Executive Leadership Seminar, Darden School of Business, University of Virginia, Charlottesville
 2014 Combined Force Air Component Commanders Course, Maxwell AFB, Ala.
 2015 Cyberspace Operations Executive Course, Maxwell AFB, Ala.
 2015 Joint Flag Officer Warfighting Course, Maxwell AFB, Ala.
 2016 Joint Senior Information Operations Course, Maxwell AFB, Ala.

ASSIGNMENTS

January 1988–January 1989, Undergraduate Pilot Training, 14th Flying Training Wing, Columbus Air Force Base, Miss.
 February 1989–May 1989, Student, Lead-in-Fighter Training, Holloman AFB, N.M.
 June 1989–November 1989, Student, F-15C Replacement Training, Tyndall AFB, Fla.
 November 1989–December 1993, F-15C Aircraft Commander, Mission Commander, Instructor Pilot, Flight Examiner, 44th Fighter Squadron, Kadena Air Base, Japan
 January 1994–June 1994, Student, U.S. Air Force Weapons School, Nellis AFB, Nev.
 July 1994–May 1997, Chief, Weapons and Tactics, Flight Commander, Assistant Director of Operations, 94th Fighter Squadron, Langley AFB, Va.
 May 1997–July 1998, F-15C Instructor Pilot, Chief of Safety, U.S. Air Force Weapons School, Nellis AFB, Nev.
 August 1998–March 2001, Assistant Director of Operations, 393rd Bomb Squadron, Whiteman AFB, Mo.

April 2001–December 2001, Director of Operations, 325th Bomb Squadron, Whiteman AFB, Mo.
 January 2002–July 2004, B-2 Program Element Monitor, Chief, Air Combat Command Senior Officer Management, Headquarters Air Combat Command, Langley AFB, Va.
 July 2004–December 2004, B-2 Requalification Training, 394th Combat Training Squadron, Whiteman AFB, Mo.
 January 2005–January 2007, Commander, 325th Weapons Squadron, Whiteman AFB, Mo.
 January 2007–July 2007, Deputy Commander, 509th Operations Group, Whiteman AFB, Mo.
 August 2007–June 2008, Student, U.S. Naval War College, Newport Naval Station, R.I.
 July 2008–August 2008, Student, T-6A Pilot Instructor Training, 559th Flying Training Squadron, Randolph AFB, Texas
 September 2008–January 2010, Commander, 71st Operations Group, Vance AFB, Okla.
 January 2010–June 2010, Vice Commander, 71st Flying Training Wing, Vance AFB, Okla.
 June 2010–June 2012, Director, Plans and Integration, Joint Functional Component Command for Global Strike, U.S. Strategic Command, Offutt AFB, Neb.
 July 2012–February 2014, Commander, 7th Bomb Wing, Dyess AFB, Texas
 February 2014–June 2015, Commander, 509th Bomb Wing, Whiteman AFB, Mo.
 June 2015–March 2016, Director, Operations, Headquarters Air Force Global Strike Command, Barksdale AFB, La.
 March 2016–July 2017, Commander, U.S. Air Force Warfare Center, Nellis AFB, Nev.
 July 2017–August 2018, Vice Director, Strategy Plans and Policy (J5), Joint Staff, the Pentagon, Arlington, Va.
 August 2018–September 2019, Vice Director, Joint Staff, the Pentagon, Arlington, Va.
 September 2019–August 2020, Director, Joint Staff, the Pentagon, Arlington, Va.
 August 2020–present, Commander, North American Aerospace Defense Command and United States Northern Command, Colorado Springs, Colo.

SUMMARY OF JOINT ASSIGNMENTS

June 2010–June 2012, Director, Plans and Integration, Joint Functional Component Command for Global Strike, U.S. Strategic Command, Offutt Air Force Base, Neb., as a colonel
 July 2017–August 2018, Vice Director, Strategy, Plans, and Policy (J5), Joint Staff, the Pentagon, Arlington, Va., as a major general
 August 2018–September 2019, Vice Director, Joint Staff, the Pentagon, Arlington, Va., as a major general
 September 2019–August 2020, Director, Joint Staff, the Pentagon, Arlington, Va., as a lieutenant general
 August 2020–present, Commander, North American Aerospace Defense Command and United States Northern Command, Colorado Springs, Colo. as a general

FLIGHT INFORMATION

Rating: command pilot
 Flight hours: more than 3,200
 Aircraft flown: T-1A, T-6A, T-37, T-38A, A/T-38B, T-38C, F-15A/B/C/D, F-35A, B-1B and B-2A

MAJOR AWARDS AND DECORATIONS

Defense Distinguished Service Medal
 Distinguished Service Medal (Air Force)
 Defense Superior Service Medal
 Legion of Merit with two oak leaf clusters
 Meritorious Service Medal with three oak leaf clusters
 Air Medal
 Aerial Achievement Medal with oak leaf cluster
 Joint Service Commendation Medal
 Air Force Commendation Medal
 Air Force Achievement Medal

EFFECTIVE DATES OF PROMOTION

Second Lieutenant Sept. 16, 1987
 First Lieutenant Sept. 16, 1989
 Captain Sept. 16, 1991
 Major Aug. 1, 1998

Lieutenant Colonel Feb. 1, 2003
Colonel Sept. 1, 2007
Brigadier General Sept. 2, 2013
Major General May 13, 2016
Lieutenant General Sep. 27, 2019
General Aug. 20, 2020

(Current as of September 2020)

**Vice Admiral Jon A. Hill, USN
Director, Missile Defense Agency
Before the
House Armed Services Committee
Strategic Forces Subcommittee
June 15, 2021**

Good morning, Chairman Cooper, Ranking Member Turner, and distinguished Members of the subcommittee. The Missile Defense Agency budget request of \$8.917 billion for Fiscal Year (FY) 2022 will enable the continued execution of the MDA mission to design, develop and deploy a layered Missile Defense System to defend the United States, deployed forces, allies, and friends from missile attacks in all phases of flight. I look forward to your continued support of this mission and this opportunity to testify before you today on Missile Defense Agency (MDA) programs and activities.

U.S. adversaries are developing more capable ballistic, hypersonic, and cruise missiles, systems with global reach, increased speed and maneuverability, greater accuracy, and improved countermeasures. North Korea is developing long-range ballistic missiles that threaten the United States and our allies in the Indo-Pacific region while also testing shorter-range maneuvering missiles. Iran continues to develop more sophisticated missiles with improved accuracy, range, and lethality. Iran is also fielding an array of increasingly accurate short- and medium-range ballistic missiles. Iran has demonstrated the ability to combine ballistic or cruise missiles with unmanned aerial vehicles in complex attacks. Russia and China operate advanced ballistic and cruise missile forces, and they are developing and deploying advanced air- and surface-launched long-range cruise and hypersonic missile capabilities.

Hypersonic missiles are being developed to bypass perceived U.S. missile defense capabilities. Regional hypersonic missiles are capable of holding deployed U.S. forces, allies, and partners at risk. Hypersonic glide vehicles delivered by ballistic missile boosters will pose new challenges to our regional missile defenses. Moreover, U.S. adversaries and strategic competitors will increasingly use cyber capabilities to seek political, economic, and military advantage over the United States and its allies and partners, including intelligence gathering on and disruption of U.S. missile defense systems.

Improving Warfighter Readiness

While the United States relies on nuclear deterrence to protect against large and technically sophisticated Russian and Chinese intercontinental missile threats to the U.S. homeland because defending against these missiles is cost-prohibitive and not technically feasible, MDA is developing and deploying homeland missile defense capabilities to address the limited but growing rogue-state offensive missile threats. At the same time, in order to address regional missile threats from any adversary, MDA is developing and deploying credible capabilities for regional defense. Rapidly advancing missile threats require MDA to employ streamlined and agile acquisition approaches to pace the threat. The Warfighter Involvement Process (WIP), led by U.S. Strategic Command, is essential for cross-coordination with all Combatant Commands and Services and results in a single set of prioritized Warfighter requirements to drive MDA investment. The WIP, coupled with the Department's missile-defense governance process, has enabled MDA's ongoing and collaborative relationships with Combatant Commands with strong partnerships across the Services and Military Departments.

Over the past year, MDA responded to and supported the Combatant Commanders and Services by delivering and sustaining sensors, battle management, engagement systems, and sustainment, all while adhering to DoD pandemic measures. MDA provides sustainment support to the Lead Services around the clock for virtually every individual component of the Missile Defense System, including testing, integration, system, and software certification, missile maintenance and recertification, and technical and logistics support.

MDA continues to make significant progress in cybersecurity by incorporating system-level requirements into system specifications and then implementing rigorous evaluation-based testing and assessments. We established a Defensive Cyberspace Operations organization, augmented the workforce with certified cyber teams to evaluate the effectiveness of cyber capabilities and implement structures to enhance our cybersecurity posture. MDA is building cybersecurity into next-generation software processes by leveraging proven secure software development, security, and operations, and establishing continuous integration. We are also closely collaborating with our Defense Industrial Base partners to protect MDA and supplier information.

Delivering Capability to Build Combatant Command and Service Capacity

MDA remains committed to developing, delivering, sustaining, and improving the nation's missile defenses and delivering capability to the Warfighter.

Space and Terrestrial Sensors

We must continue to improve sensor, and discrimination capabilities. Space is a critical domain for addressing rapidly advancing missile threats across multiple regions. SKA uses a

network of infrared sensors hosted on commercial satellites to deliver a hit and kill assessment capability for homeland defense. On-orbit SKA sensors have participated successfully in a variety of MDA flight tests and engineering activities. SKA collected hit assessment data during the 2019 GMD salvo intercept test Flight Test GMD Weapon System (FTG)-11. The effectiveness of SKA during FTG-11 drove the decision to accelerate SKA as an operational asset. SKA is currently providing situational awareness to USNORTHCOM during declared Periods of Heightened Activity. In FY 2022, MDA plans to complete development of the operational hit-assessment software code, continue developing kill-assessment algorithms and threat models, and finalize integration of SKA into the C2BMC operational interface. This will deliver an operational hit assessment capability in 2023 and a follow-on kill assessment capability.

MDA is developing a Hypersonic and Ballistic Tracking Space Sensor (HBTSS) capability to meet critical Warfighter requirements in collaboration with industry partners, U.S Space Force, USNORTHCOM, USSTRATCOM, USSPACECOM, and the Space Development Agency. Once deployed, HBTSS will be a key missile defense element by providing a persistent, global capability to detect and track dim boosting ballistic missiles, hypersonic glide vehicles, including raids. HBTSS will be integrated into the Overhead Persistent Infrared (OPIR) Enterprise Architecture and provide increased sensitivity for missile warning. HBTSS will contribute to regional missile defense against stressing threats, providing fire-control quality tracking data on hypersonic and ballistic threats for hand-over to missile defense sensors for engagement. MDA awarded two agreements earlier this year to continue the design efforts initiated in previous phases of the HBTSS program. Each performer will build an on-orbit prototype-

demonstration satellite for a planned launch in 2023. In FY 2022, as we continue tracking algorithm maturation and commence flight infrared sensor payload assembly and integration, MDA also will acquire launch services through the United States Space Force's National Security Space Launch.

After over a decade of service, the Space Tracking and Surveillance System (STSS) satellites will be decommissioned in March 2022. STSS will have supported MDA Space Research and Development for over 12 years, eight years past its design life. The program surpassed all its technical objectives, demonstrating the value of space-based missile tracking and serving as the vanguard for the next generation of missile defense space systems.

MDA is developing, deploying, and sustaining ground-based radars to counter current and future missile threats, build Warfighter confidence, and increase force structure. We are also investing in a robust sensor architecture that supports missile defense weapon systems by providing highly accurate midcourse tracking, discrimination, and battle damage assessment. MDA continues to provide software updates to the fleet of TPY-2 radars, the Sea-Based X-band (SBX) radar, five Upgraded Early Warning Radars (UEWRs), the COBRA DANE radar, and mobile Aegis Integrated Air and Missile Defense ships equipped with the SPY-1 family of radars.

Construction continues on the most advanced ground-based radar in the world, the Long Range Discrimination Radar at Clear Air Force Station, Alaska. Construction continued this year, despite a work stoppage over several months and steps to mitigate the spread of the Coronavirus. We completed installation of the primary array panel on November 30, 2020 and the secondary array earlier last year, and work is ongoing to complete the integration of critical radar components. The programmatic impacts of the work stoppage have caused the

Congressional mandate of Initial Fielding to be delayed until first quarter FY 2022. Following operational acceptance in second quarter FY 2023, the radar will provide precision tracking, persistent long-range midcourse discrimination, and hit assessment to support a capability against long-range missile threats in the Pacific theater to the U.S. homeland and conserve the number of Ground Based Interceptors (GBIs) required for threat engagement. LRDR also supports space domain awareness.

SBX is an advanced sea-mobile radar that provides precision midcourse tracking and discrimination capabilities. This past year the vessel supported operations, testing, and data collection while receiving numerous resupply and refueling missions on-station in the Pacific Ocean. SBX collected critical data from MDA and Air Force flight tests, which we use to improve sensor discrimination and demonstrate debris mitigation improvements. This capability enables higher precision target viewing, especially in highly cluttered scenes. SBX remained at-sea for 350 consecutive days prior to entering a maintenance period at Pearl Harbor, Hawaii in September 2020. In FY 2022, plans are for SBX to spend approximately 305 days at-sea to collect flight test data and conduct contingency operations for defense of the homeland. We plan to replace the processors to address obsolescence and increase processing capabilities.

MDA will continue to sustain and provide updates to the Upgraded Early Warning Radars (UEWRs). This past year MDA completed upgrades at Clear Air Force Station (AFS), Alaska and Cape Cod AFS, Massachusetts, joining the UEWRs at Royal Air Force (RAF) Fylingdales, England, Thule Air Base, Greenland, and Beale Air Force Base, California. These radars support missile defense of the homeland, detection of ballistic missile attacks, and conduct general space surveillance and satellite tracking. U.S. Space Force operationally

accepted Cape Cod AFS on November 3, 2020, and Clear AFS is scheduled to be presented to U.S. Space Force for operational acceptance by May 2021. Additionally, we completed the Digital Signal Processor Upgrade operational testing at RAF Fylingdales in March 2021 and will complete the same at Thule Air Base in June 2021.

MDA supports operation of two TPY-2 (Forward Based Mode) radars in Japan and in Israel, Turkey, and USCENTCOM. We continue to support the TPY-2 radar (Terminal Mode) as part of forward-deployed Terminal High Altitude Area Defense (THAAD) batteries in USINDOPACOM. Plans in FY 2022 include developing TPY-2 advanced discrimination algorithms to identify and track advanced threats to support operations and ground testing.

Command and Control, Battle Management and Communications (C2BMC)

C2BMC integrates the Missile Defense System and provides multiple Combatant Commanders with global, persistent, space-based infrared, land-, and sea-sensor acquisition, tracking, cueing, discrimination, and fire-control quality data to support U.S. and coalition-partner missile defense operations. C2BMC supports homeland and regional missile defense operations as well as space domain awareness. As the “brain” of the integrated Missile Defense System, C2BMC operates in a joint, multi-domain environment, interfacing with Army, Navy, Air Force, Space Force, NATO, and international systems. C2BMC provides decision makers a common operating missile defense picture capable of distributing integrated fire control quality data for external launch- and engage-on-Remote sensor operations. This capability supports global missile defense situational awareness, coalition operations, weapons release authority for homeland defense, and provides the capability to control and task a variety of sensors.

In FY 2022, MDA will continue to sustain the C2BMC fielded capability in U.S. Northern Command (USNORTHCOM), U.S. Indo-Pacific Command (USINDOPACOM), U.S. European Command (USEUCOM), U.S. Central Command (USCENTCOM), U.S. Strategic Command (USSTRATCOM), and U.S. Space Command (USSPACECOM) Areas of Responsibility. The next C2BMC upgrade, Spiral 8.2-5, builds on the currently fielded spiral to provide the integrated missile defense system and the U.S. Space Force the capability to command and control the Long Range Discrimination Radar (LRDR). LRDR enhances discrimination and fire control tracks for Ground-based Midcourse Defense (GMD). Additionally, this spiral upgrade to C2BMC adds advanced threat tracking and reporting while providing an initial space sensor tasking capability by tasking TPY-2 radars, Aegis SPY radars, and the LRDR for the critical space domain awareness mission. Our plans for future C2BMC spiral upgrades will provide initial integration with the Army's Integrated Battle Command System (IBCS), a Space-based Kill Assessment (SKA) hit assessment feature, and a debris-filtering feature from external sensors. C2BMC is also expanding support to space domain awareness by partnering with the U.S. Space Force to integrate key Space Surveillance Network sensors with missile defense sensors and communications architecture, providing USSPACECOM with an enhanced, near-real time, satellite tracking capability. We will continue risk assessments to identify and mitigate vulnerabilities.

Homeland Defense

The Department is committed to improving U.S. homeland missile defenses to counter limited missile threats from rogue states. The GMD system serves as the continuously available backbone of homeland missile defenses and is capable of defending against today's rogue state

ballistic missile threat to the homeland. We plan to upgrade and replace ground system infrastructure, fire control, and kill vehicle software to improve reliability, capability, availability, and cybersecurity. The entire GMD weapon system is currently undergoing a Service Life Extension Program (SLEP), with focus on GBI reliability and availability. We will incorporate flight-test lessons-learned in future GBI fleet upgrades while modernizing key components of the ground systems.

MDA also is developing the capability to provide the Warfighter the option of either flying the GBI using a 3-stage burn trajectory or not igniting the third-stage to provide performance similar to a 2-stage boost vehicle. This approach will improve homeland defense performance by optimizing engagement times. We plan to demonstrate this capability in the next GMD flight test, GM Booster Vehicle Test (BVT)-03, in fourth quarter FY 2021, and subsequently field it on all boost vehicle configurations. The initiation of the Next Generation Interceptor (NGI) program and SLEP activities will extend the existing GBI fleet service life beyond 2030.

MDA will improve the interceptor fleet with NGI development, with deliveries starting no later than 2028. The program will leverage the valuable technical information developed under previous MDA technology initiatives. NGI development allows trades between boost vehicle and payload, improves system survivability, and increases performance against projected rogue-state threats. Pursuing two industry approaches through Critical Design Review will reduce technical risk, secure competitive production pricing, and create incentives for early delivery to the Warfighter. MDA also is pursuing multiple contracts to support the growth and sustainment of the GMD Weapon System. As replacement for the current sole-

source Development and Sustainment Contract, MDA is pursuing a competitive acquisition strategy to satisfy future GMD weapon system requirements for future, integrated increments, enhancing GMD system engineering, integration, test, and readiness.

Regional Defense

We continue to develop new capabilities for regional missile defense.

Globally deployed and land-based Aegis BMD capabilities are critical to the nation's integrated defense for our deployed forces, allies, and partners. Aegis BMD is designed to intercept SRBMs and MRBMs in the midcourse and terminal phases of flight and IRBMs in midcourse. We will continue advancement of Aegis BMD, including continued delivery of Standard Missile (SM)-3 Block IB and Block IIA missiles, improved sea-based terminal defense, improvements in system and missile reliability, and increases in Aegis BMD engagement capacity and lethality in alignment with Navy requirements.

MDA will continue design, development, and integration of the Aegis Weapon System (AWS) with the SM-3 Block IB, Block IIA, and SM-6 missiles. This includes continued spiral development to pace increasingly complex threats in more stressing operational environments. Utilizing improved radar discrimination, we will increase Aegis performance against longer range and more sophisticated threats. We will continue adding advanced algorithms to increase lethality to our air and missile defense capabilities and developing Aegis BMD weapon system software to enhance functionality and leverage more-capable radars. MDA is also working with the U.S. Navy to refurbish existing shipboard SPY-1 radar arrays to provide increased radar sensitivity and discrimination improvements. We also plan to integrate missile

defense capability with delivery of the Navy's Air and Missile Defense Radar, the SPY-6, for enhanced engagement capability and increased raid capacity.

In November 2020, together with the U.S. Navy, MDA conducted Flight Test Aegis Weapon System (FTM)-44. During this test, the Aegis Weapons System launched a SM-3 Block IIA interceptor from the USS JOHN FINN (DDG-113) and successfully intercepted a simple rogue state threat-representative ICBM-class target. While the AWS and SM-3 Block IIA interceptors were not designed to defeat an ICBM-class target, this test demonstrated some potential limited capability. This Congressionally directed flight test leveraged residual capability in Aegis and SM-3 Block IIA using engage-on-remote sensor capabilities through the C2BMC network. We continue to improve layered defense robustness. MDA is testing Aegis BMD with all Standard Missile interceptor variants, THAAD weapon system improvements, and continued C2BMC spiral upgrades. Test results and upcoming Departmental decisions will inform the future of these assessments.

MDA supports the European Phased Adaptive Approach as the U.S. contribution NATO's missile defense capability, providing coverage and protection of NATO's European territory, populations, and forces against the ballistic missile threat from outside the Euro-Atlantic region. Currently, there is a fully operational Aegis Ashore site in Romania and a second and final European site under construction in Poland. With FY 2022 funding, MDA will continue to support operations at the site in Romania and completion of construction at the site in Poland.

Aegis Ashore Poland is currently over 90% complete site-wide and over 95% complete for the critical elements of military construction required for the Aegis Weapon System. Progress remains slow but steady despite the challenges that COVID-19 has presented. MDA

continues to work closely with the U.S. Army Corps of Engineers (USACE) to address the remaining challenges to complete the military construction and start the follow-on MDA efforts to deliver Aegis Ashore Poland to the Navy, European command, and NATO. In June 2020, we achieved the Beneficial Occupancy Date for the Naval Support Facility buildings, which we turned over to the Navy. Military construction of the Deckhouse Facility continues and the Aegis combat system installation efforts may begin as early as spring 2021. MDA and USACE continue to monitor site conditions and partner with industry to integrate portions of the combat system equipment installation with ongoing construction where possible. The combat system installation is the first in a series of events leading to operational acceptance of the Aegis Ashore Missile Defense System Complex in Poland in FY 2022.

MDA activities under the increase joint force lethality category include funding for initial development of survivable and operationally effective integrated air and missile defenses for Guam to defend Guam from ballistic, hypersonic, and cruise missile threats. Funding includes development activities, such as additional integration between Army and Navy assets, designed to support a range of architecture options, pending upcoming Departmental decisions.

MDA also is furthering the ability of partner nations to operate seamlessly with U.S. air and missile defense forces to augment our international cooperative and FMS efforts. In May 2021, MDA and the U.S. Navy will participate in Formidable Shield-21, a joint NATO exercise with multiple BMD and IAMD events at the U.K. Ministry of Defense Hebrides Test Range, along with allied participants from Belgium, Canada, Denmark, Germany, Spain, France, Italy, the Netherlands, Norway, and the United Kingdom. In the Indo-Pacific region, we continue to exercise strong bilateral alliances with Japan, South Korea, and Australia to improve our

collective security in the Indo-Pacific. MDA is continuing our longstanding cooperative efforts with Japan as it seek to improve its existing missile defense capabilities, including acquisition of the SM-3 Block IIA missile, the result of U.S.-Japan cooperative development. MDA continues to support Japan's decision to re-align the Aegis Ashore Japan FMS case to an Aegis Equipped Surface Vessel. In August 2022, MDA will participate in Pacific Dragon-22, a multilateral international exercise at the U.S. PMRF in Hawaii, along with allied participants from Japan, South Korea, and Australia.

The THAAD weapon system is a globally transportable, ground-based missile defense system that is highly effective against SRBM, MRBM, and IRBM threats inside and outside the atmosphere in the terminal phase of flight. MDA currently supports forward-deployment of two batteries stationed in the USINDOPACOM area of responsibility. THAAD has proven increasingly integral to the Defense Department's regional defense architecture. MDA received a congressional increase in FY21 for an additional THAAD battery and 30 Heavy Expanded Mobility Tactical Trucks. This congressional action expands the Army capacity to eight THAAD batteries. We will continue THAAD interceptor procurement, obsolescence mitigation efforts, production and training support, the THAAD Stockpile Reliability Program, and the initial procurement of required THAAD Battery Ground Component enhancement modifications to meet growing cybersecurity threats. MDA will continue development and integration of multiple, independent THAAD software builds to address the evolving threat, improve the Warfighter's defense planning, and improve system capability.

MDA is providing a more robust integrated air and missile defense capability, one that integrates THAAD, Patriot, and at-sea Aegis ships into a seamless network. One focus area is

the integration of THAAD and Patriot weapon systems. Patriot Launch-on-Remote (THAAD) capability will increase Patriot-defended area and engagement opportunities by allowing the Patriot Advanced Capability-3 Missile Segment Enhancement (MSE) interceptor to launch using the THAAD radar information, prior to the Patriot radar acquiring the threat. On February 20, 2020 we demonstrated, with the U.S. Army, functionality required for Patriot Launch-on-Remote (THAAD) capability in Flight Test Patriot Weapon System-27 (FTP)-27 Event (E)2. We executed FTP-27 E1 on October 1, 2020, at White Sands Missile Range, NM, demonstrating Patriot Launch-on-Remote engagement of a SRBM target using MSE interceptors and THAAD radar track and discrimination data. This improved integration demonstrated the ability to expand the Patriot battery defended area.

As the Foreign Military Sales (FMS) Implementing Agency for THAAD, MDA is executing FMS THAAD cases with the United Arab Emirates (UAE) and the Kingdom of Saudi Arabia (KSA). We continue to work the KSA FMS case, which includes seven THAAD batteries, 44 launchers, 360 interceptors, and associated equipment and support. MDA will work with the KSA to commence delivery of the THAAD capability by the middle of this decade. MDA also will continue work with the UAE to maintain and sustain its two THAAD batteries.

We have a valuable cooperative missile defense relationship with Israel. Not only can we help our partner develop systems to strengthen its missile defenses and increase interoperability with U.S. forces, but we also learn a great deal from a battle-hardened nation experienced in defeating missile threats. MDA and the Israel Missile Defense Organization (IMDO) continue to cooperate on engineering, development, co-production, testing, and fielding of the Arrow Weapon System (AWS), the David's Sling Weapon System (DSWS), and co-

production for the Iron Dome Defense System (IDDS). In 2020, MDA and IMDO cooperatively planned and successfully executed two critical flight tests. On August 12, 2020, Arrow System Test-18a (AST)-18a, an Arrow-2 interceptor flight test, demonstrated system processes, collected data for the next upgrades, and allowed for risk reduction testing of the DSWS through live intercept of the MRBM target. In December 2020, we successfully completed a series of DSWS intercept tests in an advanced system configuration against threats simulating cruise missiles and theater ballistic missiles. David's Sling Test 7 (DST)-7 proved DSWS capability against cruise and theater ballistic missiles, allowed for risk reduction testing of the AWS and IDDS, and was a key milestone in DSWS development. In FY 2022, MDA will support several flight tests across the Israeli portfolio.

Developing Technology for the Future

MDA is investing in innovative and disruptive technologies to address the emergence of new and more advanced threats. MDA's previous missile defense technology investments have transitioned into weapon systems and vastly improved interceptor seeker capability, increased the speed and range of intercept with advances in propulsion, and increased the probability of single-shot kill using multifaceted tracking and discrimination algorithms. To be responsive to evolving missile threats, we must continue to sustain, modernize, and expand missile defenses by pursuing rapid, yet measured, development of advanced missile defense concepts and technologies for homeland and regional defense.

Potential adversaries such as Russia and China continue to expand the capability and capacity of their regional offensive missile inventories, to include regional hypersonic missile

capabilities. The altitude at which these weapons fly, coupled with their aerodynamic maneuverability, make them a challenge for existing air and missile defense systems. We are investing in technology to counter these new and emerging threats by upgrading sensors and C2BMC for early warning, identification, and tracking of regional and strategic hypersonic threats, leveraging existing systems where possible to develop a layered defensive architecture against regional hypersonic threats, and making technology investments for increasing hypersonic defensive capabilities. Consistent with long-standing U.S. policy, MDA is not developing or deploying capabilities to defend the U.S. homeland against near-peer strategic hypersonic missile threats, as we rely on nuclear deterrence to address these more complex threats.

A layered hypersonic defense architecture is the most effective way to address the regional hypersonic threat. As with ballistic missile threats, the more opportunities to neutralize hypersonic threats, the better. MDA is taking steps to deliver regional, layered hypersonic defense capability to the U.S. warfighter incrementally. We are working closely with the Department of the Navy to develop and field SBT to provide the U.S. Warfighter terminal phase defense against regional maneuvering and hypersonic threats. MDA demonstrated SBT capability at-sea utilizing the AWS with SM-6 for defense against advanced ballistic missile threats during FTM-27, demonstration events conducted in December 2016 and August 2017. Upcoming flight test FTM-31 Event 1 will further demonstrate this SBT capability. MDA is anticipating SBT Increment 3 upgrade and delivery in 2024, including terminal defense capability against some regional hypersonic threats. MDA also is augmenting data on

hypersonic threats provided by the intelligence community by collecting and analyzing data from various sensors participating in U.S. hypersonic flight-testing.

To complement this terminal capability, MDA is taking steps to develop an initial glide phase intercept capability leveraging the Aegis weapon system to provide the U.S. warfighter with increasingly capable and layered regional defensive capabilities over time. In FY 2022 MDA will accelerate the development of an operational demonstration of a glide phase defense capability against regional hypersonic threats using the Aegis Weapon System. We are also developing hypersonic target systems to support robust testing.

MDA is investing in the technology development necessary for the next increment of capability, including internally-cooled seeker technology, axial upper stage capability, robust and resilient materials for hypersonic flight, and novel guidance and control capability. We will continue to strengthen efforts to deter and counter these rapidly advancing missile threats.

In response to USNORTHCOM requirements, MDA will analyze the current systems architecture for cruise missile defense of the homeland and conduct a demonstration of cruise missile defense capabilities using the Joint Tactical Integrated Fire Control (JTIFC) capability within the National Capital Region. JTIFC enhances integrated fire control capabilities across the Services by connecting existing sensors, command and control systems, and weapons at the tactical level through real-time sensor networks.

MDA continually assesses emerging and disruptive technology for potential applications to missile defense utilization. We are pursuing efforts in artificial intelligence, machine learning, nanosat technology, Left-through-Right Integration, cybersecurity, and quantum science. Key to this assessment has been the development of testbeds that allow us to exercise

and demonstrate capabilities and test new concepts, algorithms, simulations, and software. We are also expanding technology opportunities through cooperative, collaborative engagements with DoD partners and our allies.

MDA Workforce

During this unprecedented global health crisis, the MDA workforce continues to execute the missile defense mission in spite of pandemic challenges and restrictions. We were able to ensure the health and safety of the workforce while providing tools and platforms enabling continued mission success. In line with the 2020 Federal Employee Viewpoint Survey results and our initiatives to improve our culture of excellence, the MDA workforce has become even more engaged, committed, satisfied and confident in our leadership and mission.

Conclusion

Chairman Cooper, Ranking Member Turner, Members of the Subcommittee, we will continue to increase the readiness as well as the capability and capacity of fielded homeland and regional missile defense systems while investing in advanced technology to counter adversary ballistic and non-ballistic missile threats. MDA will continue to execute a robust and aggressive test program critical to system development to outpace future offensive missile systems in order to defend the U.S. homeland, U.S. deployed forces, and our allies and international partners. We also will continue to work closely with the Intelligence Community, the Services, and the Combatant Commands to ensure MDA is meeting the demand of the Warfighter.

Finally, I would like to recognize the men and women who serve in our Armed Forces at home and abroad and who operate the integrated Missile Defense System. Our Nation benefits greatly from such a highly skilled and dedicated fighting force.

I appreciate your continued support for MDA and the missile defense mission, and I look forward to answering the committee's questions. Thank you.

Vice Admiral Jon A. Hill
Director, Missile Defense Agency

Vice Adm. Jon Hill is a native of Texas, born and raised on Fort Bliss. A Surface Warfare Officer, designated as an engineering duty officer, he is a graduate of Saint Mary's University. He earned his Master of Science in Applied Physics and Ordnance Engineering from Naval Postgraduate School.

Hill's first flag officer tour was program executive officer for Integrated Warfare Systems (PEO IWS). In this role, he was accountable for developing and certifying the deployment of all surface ship combat control systems, radars, missiles, launchers, electronic warfare, naval gunnery systems, and surface and subsurface anti-submarine warfare mission capabilities within the fleet and joint force.

Hill previously served as the deputy director, Missile Defense Agency. Other leadership and acquisition engineering positions include AEGIS Shipbuilding (PMS 400), Naval Surface Warfare Center (NSWC) Dahlgren Division and Port Hueneme Division, PEO Theater Surface Combatants, and on the Assistant Secretary of the Navy staff for Research, Development and Acquisition (ASN RD&A).

He also served on the Joint Staff (J-6), U.S. Army Staff for Missile Systems, and as a senior fellow on the Chief of Naval Operations Strategic Studies Group (CNO SSG XXVII). He served as technical director for AEGIS Ballistic Missile Defense then as AEGIS Combat Systems major program manager responsible for delivering Naval Integrated Fire Control and Counter Air (NIFC-CA) and Integrated Air and Missile Defense (IAMD) capabilities to forces afloat.

In June 2019, Hill became the 11th director of the Missile Defense Agency (MDA). In this capacity, he oversees the MDA's global mission to develop, deliver, and sustain layered capabilities to defend deployed forces, the United States, allies and friends against ballistic missile attacks in all phases of flight.

Personal awards include the Navy Distinguished Service Medal, Defense Superior Service Medal (two awards), the Legion of Merit (two awards), the Defense Meritorious Service Medal (two awards), Meritorious Service Medal (three awards), Joint Service Commendation Medal, U.S. Army Commendation Medal, Navy & Marine Corps Commendation Medal (two awards) and the Navy Achievement Medal (two awards).

RECORD VERSION

**STATEMENT BY
LIEUTENANT GENERAL DANIEL L. KARBLER, USA
COMMANDING GENERAL,
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
AND
COMMANDER,
JOINT FUNCTIONAL COMPONENT COMMAND FOR
INTEGRATED MISSILE DEFENSE**

BEFORE THE

**SUBCOMMITTEE ON STRATEGIC FORCES
COMMITTEE ON ARMED SERVICES
UNITED STATES HOUSE OF REPRESENTATIVES**

FIRST SESSION, 117TH CONGRESS

FISCAL YEAR 2022 AUTHORIZATION REQUEST FOR MISSILE DEFENSE

JUNE 15, 2021

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Introduction

Chairman Cooper, Ranking Member Turner, and distinguished Members of the Subcommittee, thank you for your continued support of our Service Members, Civilians, and Families and your continued support of the Army, the U.S. Strategic Command, the U.S. Space Command, the Department of Defense, and the space and missile defense community. Thank you also for the opportunity to testify before this Subcommittee. I am honored to highlight the important space and missile defense capabilities and ongoing enhancements that enable the defense of our Nation, forward stationed and deployed forces, allies, and partners.

Today, with my assigned roles, I bring both an Army and a joint perspective on effective space and missile defense capabilities. Within the Army and joint communities, my responsibilities encompass several mission areas.

As the commander of the U.S. Army Space and Missile Defense Command (USASMDC), I have Title 10 responsibilities to organize, train, and equip Army space and missile defense forces. I serve as the Army's force modernization proponent for space, missile defense, and high altitude forces and capabilities. Further, with regard to missile defense, I am the Army Service component commander to U.S. Strategic Command (USSTRATCOM). In this role, I am responsible for planning, integrating, coordinating, and providing Army missile defense forces and capabilities in support of USSTRATCOM missions. In the space mission area, I support the U.S. Space Command (USSPACECOM) by providing trained and ready Army space warfighters and capabilities to compete, fight, and win in the space domain.

I also serve as the Army's air and missile defense (AMD) enterprise integrator. In this role, I synchronize the balanced execution of the Army's AMD posture across the functions of force planning and sourcing requirements, combat and materiel development, AMD acquisition, and lifecycle management. I coordinate with the AMD community of interest to balance priorities, inform resourcing decisions, and pursue innovative approaches in order to fulfill our AMD mission requirements.

Finally, as the commander of USSTRATCOM's Joint Functional Component Command for Integrated Missile Defense (JFCC IMD), I am responsible for providing essential global missile defense expertise in support of USSTRATCOM's Unified

Command Plan (UCP) directed missions. This entails coordinating global missile defense planning, conducting missile defense operations support, recommending allocation of missile defense assets, and advocating for missile defense capabilities on behalf of the combatant commanders. These efforts deter adversaries, assure allies, and defend U.S. deployed forces, allies, and partners against missile attacks.

Both commands are uniquely organized to conduct joint, global operations for space and missile defense and comprise multi-component Soldiers, Airmen, Sailors, Marines, Guardians, and dedicated Civilians and Contractors geographically postured to support diverse missions. Our vision is a People First team of professionals providing space, missile defense, and high altitude forces and capabilities to support joint warfighting readiness in all domains. To accomplish this vision, USASMDC is organizationally aligned to accomplish three major tasks, which can be summarized as: providing forces and capabilities for current operations; preparing forces and capabilities for the future fight; and research and development of Army technologies that will provide future advancements in space, air, and missile defense capabilities. The command aligns its activities to these priorities:

- Accomplish our mission as a People First team of empowered, innovative, ready, and resilient professionals.
- Provide trained and ready forces for space, missile defense, and high altitude missions.
- Conduct integrated planning and synchronized operations in the execution of our space and missile defense missions.
- Prepare for future conflict.

My intent today is to highlight the dedicated diverse people who serve in the geographically dispersed organizations under my command, to briefly outline the strategic environment, and to emphasize the responsibilities USASMDC bears as a space and missile defense and space force provider to combatant commanders (CCDRs). I would also like to summarize key Army AMD developments in the context of a comprehensive approach to addressing the evolving air and missile threat. Finally, I will outline JFCC IMD's role as a warfighter advocate supporting USSTRATCOM's coordinating authority for global missile defense planning.

People First

USASMDC and JFCC IMD cannot carry out our wide-ranging, no-fail, national security missions without the dedication of our greatest asset—our people. We place “People First” as we recruit, train, and develop Army space and missile defense professionals. The continued support of Congress is critical to our ability to develop and retain a highly qualified and mission-ready team. Despite the many challenges created by the ongoing coronavirus pandemic throughout the past year, our professionals remained focused on providing space and missile defense capabilities that enable multi-domain operations so combatant commanders can effectively maneuver and win. Countless examples before, and especially during, the pandemic, illustrate how our strength lies in our agile, adaptive space and missile defense team of almost 3,000 highly trained and skilled Soldiers, Sailors, Airmen, Marines, Guardians, and Civilians who stand vigilant 24/7/365 around the world, protecting the joint warfighter and defending the homeland. During the pandemic, we integrated all possible safety measures to protect personnel, preserve the command’s deployable element capability, and ensured continued readiness through training and certifications. Our innovative and empowered personnel have adapted magnificently and remain the heart of both commands. Recently released results from the 2020 Federal Employee Viewpoint Survey indicates an increasing sense of workplace pride and satisfaction within our team. It is our people who make us strong; it is our people who make winning possible.

**Spanning Across 11 Time Zones,
Nearly 3,000 Soldiers, Sailors,
Airmen, Marines, and Civilians
in 23 Worldwide Locations.**

Threat Capability Proliferation and Development

The U.S. faces challenges from adversaries who are developing capabilities to challenge, limit, or exceed our military advantage. These challenges include more lethal ballistic and cruise missiles. We must contend with a growing prevalence of enhanced air and missile threats due both to the proliferation of advanced technologies and indigenous production of these technologies. The result of this trend is an increased array of ballistic and cruise missile systems that threaten U.S., allies, and

partner missile defense capabilities as well as an ever-increasing propensity for adversaries to use these weapons against U.S. and partner forces. Our potential adversaries continue to seek and develop missile systems with advanced countermeasures, including maneuverable and multiple independent reentry vehicles and electromagnetic jamming. These characteristics, coupled with an increase in mobility, accuracy, and lethality, are intended to challenge and defeat our missile defense capabilities. Hypersonic glide vehicles delivered via ballistic missile boosters, as well as hypersonic cruise missiles under development, continue to advance as emerging threats that pose significant challenges to our systems. With the proliferation of missile technology around the world, indigenous development of ballistic and cruise missile systems is becoming increasingly affordable. Approximately 30 countries possess ballistic missile expertise with many willing to share with other countries. Threats to the homeland and other theaters will only increase.

China's missile development program continues to be the most diverse and robust in the world. Within the last two years, China has launched over 100 ballistic and cruise missiles, more than the rest of the world combined, to test and evaluate weapon system performance and effectiveness. In an effort to counter perceived threats to its national sovereignty, and reassert its perceived historical dominance throughout the Pacific and East Asia region, China continues bolstering its ballistic and long-range land attack and anti-ship missile capabilities, its command and control, and its rhetoric. Continued development enhancements provides China mainland ability to conduct precision strikes in the Western Pacific, Indian Ocean, and South China Sea. China continues emphasis on hypersonic glide vehicles to counter ballistic missile defense systems.

Russia, with its large strategic arsenal, continues upgrading both fielded and future systems with improved technologies. Moscow claims to have upgraded 82 percent of its nuclear triad, is developing several novel nuclear-capable systems, and has exhibited a growing ability to project power with long-range precision cruise missiles. Moscow is also investing significant resources in the fielding of hypersonic weapons. In October 2020, Russia successfully tested its multi-role Tsirkon hypersonic anti-ship missile with land attack capability. These new capabilities are specifically

designed to thwart ballistic missile defenses, challenge deterrence, and target our capabilities, increasing risk to allies, partners, and the homeland.

Rogue actors North Korea and Iran continue to expand their military capabilities, including the development of new ballistic and cruise missile systems, to further their regional goals to threaten the U.S. and its allies. The March 2021 North Korean missile launches highlighted the threat that its missile program continues to pose to the region, the U.S., and the international community.

"Defending the United States homeland against the ballistic missile threat remains a complex and technically challenging endeavor..."

– USNORTHCOM SASC Posture Statement
March 2021

These launches followed the October 2020 parading of an unprecedented number of ballistic missile launchers and new, larger submarine launched ballistic missiles and intercontinental ballistic missiles (ICBMs). Despite economic sanctions and the continued impact of COVID-19, North Korea continues to modernize and increase the survivability,

lethality, and diversification of its missile force. North Korea continues to emphasize the importance of its missile program for its self-defense and pursue development of a diverse short- to long-range ballistic missile inventory as a means to leverage political and economic gain and wield coercive influence over its neighbors.

Iran has the largest ballistic missile force in the Middle East. One only has to look back at the brazen missile attack on Al-Asad Air Base in Iraq in January 2020 to realize Tehran is more than willing to use its missiles to demonstrate strength and resolve, as well as to ensure the regime's survival and achieve regional dominance. Iran continues to increase the lethality, accuracy, reliability, and survivability of its missile forces, including systems with increasing ranges and anti-ship capabilities, as well as underground ballistic missile launchers. Iran has unveiled several land attack cruise missiles that could complicate missile and air defense systems. Iran is pursuing a space launch vehicle program that could shorten the pathway to future ICBM capability to further challenge U.S. strategic influence and dominate its neighbors.

Our adversaries, and in some cases, non-state actors, have proven increasingly brazen in wielding missile technologies to oppose our presence and influence, but there are additional threats that present a challenge to our missile defense capabilities. Unmanned aircraft systems (UAS) have advanced technologically and proliferated exponentially over the past decade. As technology has progressed, both reconnaissance and attack capabilities have matured to the point where UASs represent a significant threat to Army combat operations from both state and non-state actors. The broad number of missions enabled by UAS platforms in terms of size, velocity, range, altitude, and flexibility complicates the counter-UAS (C-UAS) mission for AMD forces. We appreciate that Congress authorized the Department to take actions to mitigate the increasingly challenging UAS threat to facilities and assets related to the Department's missile defense mission.

We expect space, cyber, and electronic attacks will evolve around the anti-access/area-denial (A2/AD) strategies of our adversaries. Our ability to successfully counter these continuously advancing threats will rely heavily on our increased use of space and space-enabled capabilities. Space sensors, in greater numbers and diverse bandwidths, will expand our capability and capacity to track, discriminate, and support successfully engage incoming ballistic, cruise, and hypersonic weapons.

The strategic AMD environment is becoming more challenging as threat systems continue to proliferate in number and advance in complexity. Our evolution of capabilities requires a holistic strategy that effectively integrates alternative approaches and technologies to defeat air and missile threats. A comprehensive approach, including attack operations, active and passive defenses, and integrated command and control (C2), increases lethality and enables more efficient and effective active missile defense capabilities. In addition, implementing technological advances requires more joint and partner nation data-sharing to enable integration of current and future capabilities. We continue to prioritize integrated (IAMD) resources to optimize warfighter support and partner with the Missile Defense Agency (MDA), combatant commands (CCMDs), and the Services in pursuit of fiscally responsible methods to address evolving threats.

Global Posture to Counter the Threat

Strategic positioning must seek to deter adversary missile systems' development, deployment, and employment. To that end, a layered and integrated approach that synchronizes offensive and defensive capabilities ensures U.S. forces are prepared to leverage the full complement of fires in crisis and conflict. Effective active defense and pre-launch attack operations requires successful integration of multi-domain capabilities spanning from tactical to strategic, departmental to interagency, and includes allies and partners.

To counter the threat and meet the objectives of the 2018 National Defense and Army Strategies, USSTRATCOM and the U.S. Army continue to enhance homeland and regional active missile defenses as part of our evolving joint all-domain operations concept. We must also continue to work with our allies and partners in Europe, the Indo-Pacific region, and the Middle East to increase missile defense systems and operations integration and interoperability.

In conjunction with our allies and partners, the Department maintains deployed and forward-stationed Patriot; Terminal High Altitude Area Defense (THAAD); Army Navy/Transportable Radar Surveillance and Control, Model 2, Forward-Based Mode (AN/TPY-2 FBM) radars; Avenger Air Defense Systems; Sentinel radars; and counter-rocket, artillery, and mortar (C-RAM) forces to enhance our AMD posture, sending a deterrence message to competitors and assurance to our friends. Through deployed and forward-stationed AMD commands and air defense brigade headquarters, we continue to work with regional partners and allies to increase information and data-sharing that leverages partner nations' growing capabilities and capacity. These efforts are intended to reduce the strain on U.S. forces and enhance strategic flexibility while enabling more timely modernization of our AMD assets.

Army Air and Missile Defense 2028 is the framework guiding AMD readiness and modernization. It is the product of the Army AMD enterprise, which consists of agencies and organizations that develop, maintain, sustain, train, and employ AMD capabilities. This document is based on the 2017 National Security Strategy, the 2018 National Defense Strategy, the 2019 Missile Defense Review, the U.S. Army in Multi-Domain

Operations 2028, and the Army Operating Concept, as well as the changing operational and threat environments and the rapid pace of technological advancement.

The Air and Missile Defense Cross-Functional Team (AMD CFT) is the key agent that is rapidly facilitating capability development in accordance with AMD 2028. It is ensuring future capabilities transition quickly from concept, to prototyping, to fielding. The programs that Army AMD is rapidly developing are: Integrated AMD Battle Command System (IBCS); Maneuver-Short Range Air Defense (M-SHORAD); Indirect Fire Protection Capability (IFPC); and Lower Tier Air and Missile Defense Sensor (LTAMDS). The AMD CFT also works closely with the Rapid Capabilities and Critical Technologies Office (RCCTO) on DE capabilities to include high energy lasers (HEL) and high power microwave (HPM) systems.

Providing and Enhancing Missile Defense Capabilities

In accordance with Title 10 responsibilities, USASMDC is a force provider of missile defense capabilities. As a force provider, our first major task is to provide trained and ready missile defense forces and capabilities to the CCDRs. This command is manned by multi-component Soldiers, Civilians, and Contractors who contribute to operations, planning, integration, control, and coordination of Army forces and capabilities in support of USSTRATCOM's missile defense mission. Other commands around the world, including all CCDRs, also leverage the capabilities we provide. For example, USASMDC Soldiers serving in the homeland and in remote and austere forward-deployed locations operate the Ground-based Midcourse Defense (GMD) system and the AN/TPY-2 FBM radars. Highlights of the capabilities provided to current operations and readiness by our missile defense professionals include:

"While current capabilities provide defense of the homeland against a rogue ballistic missile threat, a concerted effort and commitment is required to expand and improve existing capabilities for both homeland and regional missile defense."

- USSTRATCOM SASC Posture Statement
April 2021

Support to Homeland Missile Defense: Soldiers from the 100th Missile Defense Brigade (MDB), headquartered in Colorado Springs, Colorado, and the 49th Missile Defense Battalion, headquartered at Fort Greely, Alaska, are ready to defend our Nation from an ICBM attack 24/7/365. In support of U.S. Northern Command (USNORTHCOM), Army National Guard and Active Component Soldiers operate the GMD Fire Control Systems located at the Fire Direction Center in Alaska and the Missile Defense Element in Colorado; a detachment oversees operations at Vandenberg Air Force Base, California. These Soldiers, in conjunction with USNORTHCOM, also oversee maintenance of GMD interceptors and ground system

"...support continuing improvements to our homeland missile defense architecture."
 - SECDEF SASC Confirmation Hearing
 January 2021

components. At the Fort Greely Missile Defense Complex, the 49th Missile Defense Battalion military police secure the interceptors and C2 facilities from physical threats. Given their strategic mission in this remote location, the harsh environment and 20-hours per day of

winter darkness, we must continuously review and enhance the Fort Greely Garrison services and support to these Soldiers, Civilians, Contractors, and their Families. Soldiers from the 1st Space Brigade provide combatant commanders with certified AN/TPY-2 FBM missile defense batteries that support strategic and regional missions. These batteries are globally located in five strategic locations where they provide a tangible contribution to both homeland and regional defense. Soldiers manning these radars, deployed to remote and austere locations, demonstrate daily our Nation's commitment to defend deployed forces, allies, and partners from ballistic missile attacks while also providing space domain awareness.

Support to Global Missile Defense Test and Development: Soldiers from the 100th MDB and the 49th Missile Defense Battalion participate in GMD test activities and work with MDA developers on future improvements to the GMD system. MDA's testing regime, conducted through a series of ground-based and operational flight tests, and rigorously verified, validated, and accredited models and simulations, emphasizes operational realism during test design and execution. This realism enables Soldiers of

the 100th MDB to sustain and improve their proficiency and validate operational employment of the system.

Global Missile Defense System Development: MDA continues to evolve the GMD weapon system to enhance existing capabilities, as well as deliver new capabilities. Construction of Fort Greely's Missile Field 4 is scheduled to be complete in June 2022 and will provide additional capacity and flexibility by the end of the calendar year. The Next Generation Interceptor (NGI), once developed, will be a significant upgrade compared to the current interceptor fleet, providing the warfighter with improved system performance and greater reliability.

"Missile defense endures as a critical component for comprehensive strategic and tailored regional deterrence."

- USSTRATCOM SASC Posture Statement
April 2021

Space Support to Missile Early Warning: Space-enabled capabilities are essential for missile defense operations. They provide and enable communications; positioning, navigation, and timing; intelligence, surveillance, and ACECOM's National Space Defense Center to ensure that space assets are poised reconnaissance; and early warning. We routinely coordinate and collaborate with USSPACECOM's National Space Defense Center to ensure that space assets are poised to support missile defense.

In support of joint force commanders, USASMDC continues to provide missile warning within the U.S. European Command (USEUCOM), U.S. Central Command (USCENTCOM), and U.S. Indo-Pacific Command (USINDOPACOM) theaters of operations. The 1st Space Brigade's Joint Tactical Ground Station (JTAGS) detachments, which are essential for USSPACECOM's assured missile warning mission, are operated by USASMDC Soldiers who monitor launch activity and other events observed by infrared sensor platforms and quickly provide information to members of the AMD and operational communities. Our JTAGS detachments are forward stationed around the globe, providing continuous, dedicated, assured missile warning to USSPACECOM and CCDRs in support of deployed and forward-stationed

forces. JTAG's forward stationing reduces the risks of solely relying on long-haul communications and ensures the resilience of USSPACECOM's comprehensive missile warning system.

The relocation of the JTAGS Europe detachment from Stuttgart, Germany, to Sigonella Naval Air Station, Italy, and the installation of the Korea detachment into a new facility on Osan Air Base, Korea, have been completed, increasing our operational missile warning capability. Future capability development will enhance missile warning and modernize air and missile defense by providing the means to detect and track new missiles in an increasingly electronic warfare and cyber contested environment.

"The American way of life depends on reliable access to the space-based capabilities that provide the foundation of our economic security and enable our Joint Force to conduct sustained military operations in all domains."

- USSPACECOM SASC Posture Statement
April 2021

Extended ranges needed to enhance early warning to ground forces and defend U.S. and our allies' infrastructure while supporting Army Long Range Precision Fires (LRPF) and enabling sensor-to-shooter capabilities as part of Army Multi-Domain Operations (MDO) will be realized.

USASMD's second major task is to develop future missile

defense forces and mature current capabilities. The Space and Missile Defense Center of Excellence (SMD CoE) represents Army equities across the joint community. Within the capabilities of Army and joint space, missile defense, and high altitude, the SMD CoE trains and educates agile, adaptive, and ready Soldiers and leaders; executes lifecycle management for U.S. Army space operations officers; develops Army Space Soldiers; and enables informed decision making.

To carry out its mission, the SMD CoE executes U.S. Army Training and Doctrine Command and Army Futures Command established practices to meet force management and Army modernization enterprise responsibilities. This includes performing concept development, capabilities determination, and capabilities integration relative to doctrine, organization, training, materiel, leadership and education,

personnel, facilities, and policy for process change, integration, and transition for materiel development. Additionally, the organization executes the Army's institutional training and education for space and global missile defense mission areas.

In 2020, USASMDC established the Office of the Commandant within the SMD CoE. This office provides a single point of focus for the education and training of skilled military and civilian space personnel and also provides doctrinal support for space and missile defense operations to enable Army forces to support the full range of multi-domain operations. As the proponent for Army space training and Army space doctrine, the commandant's office manages the eight personnel life-cycle management functions for all Army space personnel in both the active and reserve components.

Also this past year, SMD CoE's Space and Missile Defense School earned TRADOC's highest accreditation rating. The school executes the Army's institutional training and education for space and GMD mission areas. It currently conducts 20 space and missile defense courses that serve to develop all individual training tasks and necessary products to conduct Soldier-focused education and mission qualifications training. Despite the challenges of the pandemic, the school is projected to train approximately 12,000 Army Soldiers, Space Cadre, and missile defense operators this year through 120 formal course offerings and support training for 25 brigade combat teams, six divisions, and four corps. The SMD School continues to expand its current mission to educate, train, and develop world-class, highly skilled Army space and missile defense professionals to support Army and joint multi-domain operations at the strategic, operational, and tactical levels. Additionally, in support of the Army Space Training Strategy, the school coordinates directly across every Army proponent school to integrate space education and training in Army professional military education and functional qualification training.

The SMD CoE's Army Space Personnel Development Office (ASPDO) executes Functional Area 40 Space Operations Officer life-cycle management. The ASPDO conducts strategic planning, ensuring Space Cadre billets are identified, created, and tracked to support space-related missions. Successfully filling Space Cadre billets enables the Army to fulfill mission requirements in the eight codified joint space capabilities: space situational awareness; positioning, navigation, and timing; space

control; satellite communications; satellite operations; missile warning; environmental monitoring; and space-based intelligence, surveillance, and reconnaissance.

USASMDC's third major task is to provide critical technologies to address future needs that will enhance warfighter effectiveness. USASMDC's Technical Center supports the joint warfighter by providing science, technology, and test and evaluation expertise to enable warfighter dominance today and in the future. As part of the Army science and technology enterprise, the Technical Center contributes to the current fight and enables the next generation to prevail in conflicts to come. The Technical Center focuses on three essential tasks: executing science and technology research and development, test, and evaluation; managing and operating the Ronald Reagan Ballistic Missile Defense Test Site; and conducting space operations and space domain awareness.

The following are a few summaries of our science and technology research and development efforts, as well as an overview of the capabilities and recent accomplishments of an essential Army testing range.

Directed Energy (DE): The Technical Center is the Army lead for HEL technology development. This technology can be effectively employed in a variety of mission areas and offers unique performance attributes that will contribute directly to addressing existing operational capability gaps. High energy lasers are a low-cost, effective complement to kinetic energy to address rocket, artillery, and mortar (RAM) threats; unmanned aircraft systems; and cruise missiles. Additionally, the Technical Center is exploring the use of high power microwave technology for use in interdicting UAS and defeating improvised explosive devices and other improvised threats. DE work and advancements contributes directly to the development of the next generation of directed energy scientists and engineers.

The Army is leveraging DE technologies that presently exist and integrating them with Army platforms to provide additional warfighter capacity.

Tactical Space and High Altitude Technologies: As the Army lead for space and high altitude research, development, and engineering, our Technical Center identifies, develops, demonstrates, and integrates technologies in the areas of responsive space, space superiority, and high altitude. To meet Army operational needs using small satellites and high altitude platforms, focus areas include persistent beyond line-of-sight communications for forces deployed in remote areas; functionally effective resolution imagery; solutions for assured positioning, navigation, and timing; ground C2 systems to reduce operator burden; and direct downlink of tactical data feeds. Promising technologies are transitioned to the Army RCCTO, program executive officers, program managers, and users to provide for current and future Army and joint warfighter capabilities.

Systems Engineering: In mid-2020, USASMDC established a Systems Engineering Directorate within the Technical Center. The goal was to intensify the focus on in-house research and expand laboratory capability. Also last year, USASMDC initiated construction on a research, development, test and evaluation facility—the Directed Energy Systems Integration Lab. The future lab will provide opportunities for early warfighter involvement and be equipped with specialized equipment to enhance research, modeling, simulation, and testing of DE applications. In the years ahead, integration labs focused on small satellites, hypersonic aerothermal, and AMD systems are planned.

Missile Defense Testing Assets and Range: USASMDC's Technical Center is an invaluable part of the Army Test and Evaluation Enterprise and provides a suite of low-cost ballistic missile targets for use in developmental and operational AMD testing, transportable and configurable launchers, and test support. Additionally, the Technical Center is providing hypersonic flight test support from the test planning and design phase through mission execution and post-flight analysis for the Army, Navy, and Air Force. The Ronald Reagan Ballistic Missile Test Site (RTS) at the U.S. Army Garrison-Kwajalein Atoll in the Republic of the Marshall Islands provides test support to the MDA, the U.S. Air Force, NASA, and others. The strategically located, remote site provides critical testing support to both offensive and defensive missile testing requirements for programs such as GMD and U.S. Air Force strategic ballistic missile systems. RTS

retains preeminent ballistic missile testing capabilities used in validating the Nation's ability to sustain a strong, credible ballistic missile deterrent as a key element of national security and the security of U.S. allies and partners.

RTS continues to support the developmental and operational testing of both homeland and regional missile defense systems as well offensive ballistic missile testing for the Air Force Global Strike Command. During 2020, RTS supported four Minuteman III test launches (Glory Trips) to successfully validate and verify the effectiveness, readiness, and accuracy of the weapon system. This past November, RTS supported MDA's successful FTM-44 test through the launch of an ICBM-representative target as well as providing range safety support. Hypersonic system testing has become a significant element of test planning at RTS. Because of its geographic remoteness and available complex sensor suite, RTS has seen a significant upswing in hypersonic systems test planning. There are currently two hypersonic operational tests scheduled for calendar year 2021.

In concert with its testing mission and using a suite of four of the world's most sophisticated radar systems, RTS also supports the command's space object identification and space domain awareness missions in support of USSPACECOM. This mission includes space object tracking and characterization, providing critical

**Reagan Ballistic Missile
Defense Test Site: A
Vital National Asset**

orbital information on new foreign launches, and providing high-resolution images in support of space situational awareness. RTS supports this mission 24/7/365. The U.S. Air Force's Space Fence is a new and important capability in this mission. Last spring, the Space Fence became

operational, and now provides proactive space domain awareness while complementing existing systems at the RTS. Finally, RTS works in conjunction with DoD customers to develop and demonstrate space testing capabilities. These emerging capabilities and test missions provide essential data and feedback to the space enterprise and support customers concerning spacecraft and operational performance.

Army Contributions to the Nation's Missile Defense Capabilities

Army Air and Missile Defense 2028 meets the directives of the 2018 National Defense Strategy and the Army Vision to enable MDO. To achieve the AMD force of 2028, we must continue to modernize and develop AMD capabilities, build sufficient AMD capacity for MDO, and ensure AMD forces are trained and ready. MDO requires that our capabilities and associated C2 systems are resilient and interoperable with joint and allied forces. Accomplishing these essential tasks will allow us to provide deterrence through deployments and forward stationing and enable a more robust, comprehensive defense by coordinating and integrating with our partners and allies. AMD is one of six Army modernization priorities in which the Army has significantly increased investment. The Army AMD CFT is the Army's modernization lead for these capabilities and works closely with the other Services, the Joint Staff, and MDA toward joint IAMD capabilities. The Program Executive Office for Missiles and Space is the Army's materiel developer for these capabilities and works closely with the AMD CFT and the U.S. Army Aviation and Missile Command. A summary of the Army's AMD strategic direction and major programs follows:

The AMD force must be agile, rapidly tailorable, scalable, and able to fight multiple, complex, integrated attacks.

Air and Missile Defense Readiness: A convergence of factors impacts the AMD force's readiness, to include the enduring operational demand of the CCMDs, the transition to great power competition and its associated complex threat set, and the overdue and critical need to modernize the Army's AMD force. The operational demand to meet the requirements of joint warfighters continues to stress the Army AMD force, impacting current and future readiness, as well as modernization initiatives and air defense artillery (ADA) Soldiers. The enduring high operational tempo combined with limited deployment predictability, negatively impacts Soldier readiness and family well-being. Currently, more than twice the number of ADA Soldiers are dwell restricted as compared to the overall Army. In an effort to improve Soldier predictability and readiness, the Army has established a new Unit Life Cycle Modernization Model known

as the Regionally Aligned Readiness and Modernization Model (ReARMM). It is critical that the ADA force leverage ReARMM to inform force availability to the Joint Staff and Office of the Secretary of Defense (OSD) to improve deployment predictability for AMD Soldiers. The implementation of ReARMM nests neatly with the near term Patriot modernization efforts including IBCS and LTAMDS and will help to provide balance across readiness, predictability, modernization, and Soldier quality of life.

Mission Command: Closely linked to AMD readiness is the ability to provide low density, high demand AMD mission command elements. The mission command elements are pivotal to laying the foundation and creating an environment that supports the integration of Army AMD forces into joint C2 architectures. Over the past few years, the Army has activated an additional Active Component air defense artillery brigade headquarters in USINDOPACOM, rotated a National Guard air defense artillery brigade headquarters to USEUCOM, and elevated the command of the 10th Army Air and Missile Defense Command in USEUCOM to a general officer.

Integrated AMD Battle Control System: The IBCS program is a top Army AMD modernization priority. IBCS combines current and future AMD sensors and weapons into a common integrated fire control capability that allows the warfighter to integrate AMD capabilities fully across all echelons. IBCS is the direct replacement for the mission command nodes for the Patriot weapon system, the THAAD weapon system, the headquarter elements, and the airspace management cells. It allows rapid convergence of sensors, shooters, and mission command components on an integrated fire control network. Once fully fielded, IBCS will provide a game-changing capability, allowing AMD forces to be tailored and scaled appropriately to meet the given threat. The quantity and mix of capabilities can be dynamically retasked into a formation with an inherent, integrated mission command system to build tiered and layered defenses. The IBCS open architecture enables rapid integration of legacy and developmental sensors and shooters providing capabilities to defeat emerging threats in MDO. This year the IBCS program passed the Milestone C decision and will progress to low-rate initial production. Training is currently underway with an air defense battalion in preparation for the IBCS initial operational test and evaluation scheduled to begin in the coming months.

The program will field common mission command nodes for Army AMD forces to defend against manned aircraft, UAS, air-to-ground missiles, tactical ballistic missiles, cruise missiles, and RAM attacks. Ultimately, the IBCS will operate with air surveillance and fire control capabilities across the Army, Air Force, Navy, and with joint and multinational AMD forces at all echelons. It will enhance the lethality of the AMD force. By dismantling the current system-centric mission command paradigm, it will dramatically increase systems capability and facilitate open industry competition in support of the AMD community. IBCS is one of the Army's contributions to Combined Joint All Domain Command and Control (CJADC2) under development between the Army and Air Force, and there is continued experimentation to link with C2 systems for Army and joint fires. Additional efforts are currently underway to fully support IBCS interoperability with MDA's Ballistic Missile Defense System (BMDS). The efforts explore the feasibility and potential benefits of integrating IBCS with MDA's Command and Control, Battle Management, and Communications (C2BMC).

Terminal High Altitude Area Defense System: THAAD is a key component of the missile defense system architecture. It is designed for area defense of deployed and allied forces, population centers, and critical infrastructure against short-, medium-, and intermediate-range ballistic missiles. THAAD is a mobile and globally transportable, low density, high demand asset. THAAD has a unique endo- and exo-atmospheric intercept capability using proven hit-to-kill technology. There are currently seven operational THAAD batteries. THAAD batteries are forward stationed to Guam and the Republic of Korea in response to the North Korean nuclear and missile threat, as well as forward deployed to USCENTCOM. The development efforts associated with U.S. Forces Korea (USFK) Joint Emergent Operational Needs JEON) improve Patriot and THAAD interoperability and brings a Patriot launch-on-remote capability and a THAAD Missile Segment Enhancement (MSE) Integration in Fiscal Year 2021. As directed in the 2019 Missile Defense Review, the Army, in conjunction with OSD and MDA, reassessed the THAAD requirement as eight batteries.

Patriot/Patriot Advanced Capability-3 Missile Segment Enhancement (PAC-3 MSE): The Army Patriot force remains the cornerstone of AMD protection for our deployed forces, friends, and allies. The Patriot force is 53 percent forward stationed or

deployed as CCDRs' increasing AMD requirements drive the operational tempo, stress the Patriot force, and have resulted in modernization challenges. The PAC-3 and PAC-3 MSE interceptors employ a hit-to-kill capability. PAC-3 MSE fills the engagement gap between the THAAD and the PAC-3 missiles while also defeating advanced threats earlier, at greater range, with increased lethality. The PAC-3 MSE is in full-rate production and is the latest generation hit-to-kill PAC-3 interceptor in the Patriot force to meet global capability requirements. Annual PAC-3 MSE production capability has increased by approximately 30 percent to address U.S. requirements and demand from our international partners.

Patriot must continually modernize through software and hardware upgrades to address obsolescence and the evolving threat, and to best utilize the extended battlespace performance afforded by the PAC-3 MSE interceptor. Modernization efforts provide combat identification enhancements, address upper-tier debris mitigation, improve performance of the PAC-3 MSE interceptor, and enable increased Army and joint interoperability. The Army has modernized 12 of 15 Patriot battalions with the latest software and hardware capabilities to counter new emerging and evolving threats. The other three Patriot battalions will complete modernization this year. Ongoing development efforts include the enhanced interoperability of Patriot and THAAD systems. This new integrated capability expands Patriot's battlespace by enabling it to leverage THAAD's AN/TPY-2 radar together with the Patriot radar to detect threat targets at greater ranges. Originally developed for USFK, where it will be fielded this summer, this capability will be pure-fleeted across all Patriot battalions beginning in Fiscal Year 2023. To overmatch the near-term evolving threat, the Army is continuously improving Patriot capability while moving toward the IBCS architecture including a new sensor and fire protection capability.

Lower Tier Air and Missile Defense Sensor: Replacing the current Patriot radar, LTAMDS will provide networked sensing capabilities in the lower-tier portion of the missile defense battlespace and enable the full capabilities of the PAC-3 MSE missile. LTAMDS significantly expands capabilities over legacy Patriot radars by enabling full capabilities of the MSE and all of the benefits of being a networked sensor on the IBCS. The modern technology will reduce the current Patriot radar operations and sustainment

costs by enhancing reliability and maintainability. The Army plans to begin testing the initial LTAMDS prototypes with IBCS and PAC-3 in early Fiscal Year 2022 with the objective of fielding four sensors to one battalion during the upcoming calendar year.

Indirect Fire Protection Capability: The IFPC is a ground-based weapon system designed to acquire, track, engage, and defeat cruise missile, UAS, and RAM threats. The Army requires an IFPC that integrates with the IBCS as its C2. This will enable a MDO-ready Army by 2035. The Army awarded a contract to the Israel Missile Defense Organization for two batteries of the Iron Dome system as an interim cruise missile defense capability in accordance with the Fiscal Year 2019 National Defense Authorization Act. The first Iron Dome battery arrived in the U.S. in December 2020 and will be ready to deploy before the end of this fiscal year. In February 2021, the second battery arrived in the U.S. and will be prepared to deploy in the first quarter of Fiscal Year 2022.

The Army is currently executing a competitive acquisition strategy to develop and field an enduring IFPC capability integrated with IBCS. The approved competitive acquisition includes a shoot-off demonstration this summer, a follow-on performance assessment using vendor models and simulations, hardware-in-the-loop activities, and industry proposals leading to a contract award later this year. Delivery is scheduled in Fiscal Year 2023, which will lead to the first battalion fielding by Fiscal Year 2026. The Army continues to mature HEL and HPM to increase IFPC capabilities in support of the maneuver force. The Army will begin to integrate DE by fielding four HEL and HPM prototypes in Fiscal Year 2024. Ultimately, IFPC battalions will contain a mix of complementary DE and kinetic intercept systems to protect the maneuver force.

Counter-Small Unmanned Aircraft Systems: Technological advances and the proliferation of commercial and tactical UAS in both reconnaissance and attack capabilities have matured to the point where they represent a significant threat to Army operations from both state and non-state actors. To address these threats, the Army, at the direction of the Secretary of Defense, assumed executive agent responsibilities for countering UASs and established the Joint Counter-Small UAS Office (JCO). Key focus areas for the JCO include developing joint requirements and materiel solutions, as well as joint training and doctrine. C-sUAS efforts are critical to defeat the rapid proliferation

of small, commercially available, UAS technology on the battlefield. In response to a warfighter Joint Urgent Operational Needs Statement (JUONS), the Army deployed over 500 man-portable, expeditionary, and mobile C-sUAS systems and continues to adapt to changes in-theater UAS threats. The JCO continues to work across the DoD to synchronize and coordinate the development of C-sUAS technologies that meet service specific and joint requirements. Developmental efforts such as HPM and DE are critical to ensure that we maintain pace with both commercial and state developed UAS.

Maneuver-Short Range Air Defense: In response to identified operational needs, M-SHORAD will provide maneuver forces a dedicated air defense capability on a Stryker-based platform against fixed-wing, rotary-wing, and UAS threats. In Fiscal Year 2018, the Army approved and began developing initial M-SHORAD systems that integrate existing Army capabilities onto a Stryker combat vehicle. Developmental testing was conducted over the past year and an operational assessment was accomplished last fall. Four M-SHORAD battalions are planned for fielding in Fiscal Years 2022 and 2023. The Army continues to mature HEL and electronic warfare technologies to increase M-SHORAD capabilities in support of the maneuver force. The Army will begin to integrate DE by fielding four DE M-SHORAD prototypes in Fiscal Year 2022. Ultimately, M-SHORAD battalions will contain a mix of complementary DE and kinetic intercept systems to protect the maneuver force.

**Joint Functional Component Command for Integrated Missile Defense
(JFCC IMD)—Integrating and Synchronizing Missile Defense**

JFCC IMD is USSTRATCOM's missile defense integrating element. USSTRATCOM formed JFCC IMD to execute its UCP assigned missile defense responsibility, enabling the headquarters to focus on integration and advocacy. Established in 2005 and headquartered at Schriever Air Force Base in Colorado Springs, Colorado, JFCC IMD is manned by a cohesive team of Army, Navy, Air Force, Space Force, Marine Corps, Civilian, and Contractor personnel. The headquarters location at MDA's Missile Defense Integration and Operations Center allows JFCC IMD to leverage MDA's existing infrastructure and ensures a continuing strong partnership with the materiel developer in the execution of the command's assigned responsibilities.

As outlined in previous testimonies, warfighters remain confident in our ability to protect the Nation against missile attacks. However, given the transregional nature of the threat and the low-density, high-demand nature of missile defense platforms and increasing complex architecture of sensors, shooters, and command and control nodes spanning multiple areas of responsibility, CCDRs must approach missile defense from a global perspective. To meet this challenge, we must invest in holistic approaches to defeat adversary missiles before launch or during all phases of flight (boost, midcourse, and terminal phases). Additionally, we must continue to invest in capabilities that limit or mitigate the effects of an attack that could possibly penetrate our defenses. JFCC IMD provides direct support to these efforts.

JFCC IMD is the recognized subject matter expert across the missile defense enterprise in matters of operational support, policy, strategy, training and education, and advocacy. The command's principal mission is to coordinate with, and operationally support, joint warfighters from the regional CCDRs, and advocate for their requirements with the materiel developers at MDA and the Services. On behalf of the USSTRATCOM and other CCDRs, JFCC IMD champions warfighter priorities and capability needs, including continued development of a robust sensor network, integrated discrimination capabilities, redundant and resilient C2 networks with enhanced cybersecurity defenses, and improved interceptors for both homeland and regional missile defenses.

JFCC IMD works across the DoD and alongside key allies and partners to improve integration of existing capabilities, maximizing efficiency and effectiveness in global missile defense missions. The essential force multiplier is integration—a critically important mission enabler that JFCC IMD directly supports. As a functional component command of USSTRATCOM, JFCC IMD supports designated UCP responsibilities along four lines of effort:

- Synchronizing global missile defense planning, global force management, and missile defense security cooperation activities.
- Conducting global missile defense operations support, to include asset management, alternate execution authority, federated intelligence support, and network monitoring and protection.

- Executing above element, joint, and combined global missile defense training and education, exercises, and experimentation.
- Advocating for and recommending acceptance of global missile defense capabilities, conducting analysis and assessments of current and future capabilities, and support tests.

To accomplish these efforts, we maintain close collaborative relationships with the CCDRs, the MDA, the Services, the OSD, the Joint Staff, and our allies and partners. We continually seek to enhance our deployed forces' capabilities while gaining operational experience and confidence in our collective ability to defend the Nation, deployed forces, partners, and allies. Some of our key efforts to enhance missile defense planning and capabilities for both the homeland and regional architectures follow:

Expansion and Integration of the Missile Defense Architecture: In response to the evolving strategic environment, we continue to bolster homeland and regional missile defense capabilities. In development of the global missile defense mission, we are supporting the advancement of the new capabilities such as the Aegis Ashore in Poland; the Standard Missile-3 Block IIA; the Long Range Discrimination Radar at Clear Air Force Station, Alaska; Spacebased Kill Assessment; Hypersonic and Ballistic Tracking Space Sensor; Next Generation Interceptor for homeland defense; hypersonic defense; and various other new capabilities such as incorporating DE technologies. Given the many challenges associated with implementation of these architectures, JFCC IMD, in support of USSTRATCOM's responsibilities for global missile defense, collaborates with the CCDRs to assess and address cross-regional gaps in the areas of planning, policy, capabilities, and operations. As an example of collaboration, JFCC IMD is leading a new effort to document the comprehensive, warfighter top-level capability attributes for the hypersonic defense mission enabling early warfighter involvement with MDA in the development of new capabilities to meet the advanced threat.

Multi-Regional Missile Defense Asset Management: JFCC IMD, in coordination with USSTRATCOM and the CCDRs, manages missile defense operational readiness posture, coordinates missile defense system maintenance, and supports MDA and

Service tests. The asset management process allows us to continually assess our readiness to defend against missile attacks and to recommend adjustments to optimize the overall missile defense architecture.

Cybersecurity of the Ballistic Missile Defense System: JFCC IMD, in coordination with USSTRATCOM and MDA, conducts the Cybersecurity Service Provider mission for the missile defense architecture to ensure cyber defenses and operations are planned and executed across the globe. JFCC IMD works with key stakeholders to enhance the cyber defense posture of our missile defense operational architecture against malicious activity. We are collaborating with our mission partners to incorporate realistic cybersecurity testing in support of the Warfighter Capability Acceptance process. We are working with the National Security Agency's Cybersecurity Directorate to use their insights on threat analysis and mitigations to continue to harden our internal networks against adversary intrusion and attack. JFCC IMD also works closely with the Joint Staff, CCMDs, and MDA to educate, train, and exercise cybersecurity protocols to ensure the highest levels of readiness.

Global Planning Integration and Support: JFCC IMD works with the missile defense community to refine processes that synchronize transregional global missile defense planning and operations. Consistent with the Department's transition to planning based on adversary problem sets, JFCC IMD supports the CCDRs in refining their adversary-centric missile defense plans with objective analysis of missile defense risks across multiple problem sets. This assessment methodology identifies systemic risk, informs recommendations for shortfall mitigation, and increases effectiveness in future missile defense planning efforts. This analysis informs bundled plans assessments across the missile defense enterprise, which shape recommendations for global force management and future capability advocacy. Looking forward, we will work with the warfighter community to increase integration, enabling a more holistic approach to missile defense.

Global Force Management: USSTRATCOM, as the designated Joint Functional Manager for Missile Defense, relies upon JFCC IMD to evaluate and recommend to the Joint Staff risk-informed sourcing of missile defense requirements. Due to the low density/high demand nature of missile defense assets, all sourcing decisions have a

direct and significant impact on other CCDRs' campaign and contingency plans. We continue to refine our approach, ensuring integrated capabilities are appropriately postured to counter transregional threats in accordance with the 2018 National Defense Strategy, the 2019 Missile Defense Review, and Department steady-state priorities. This globally integrated approach serves as the baseline for our risk-based recommendation into the Global Force Management process, enabling senior leaders to make informed decisions on allocation of low density missile defense forces.

Allied and Partner Missile Defense Integration: Given that we will never have enough active defense capacity, integrating our allies and partners into a common and mutually supportive architecture is a critical warfighter priority. One venue aimed at promoting increased cooperation is the Nimble Titan Campaign of Experimentation—a biennial series of multinational missile defense experiments. Nimble Titan brings together policy and military subject matter experts from allied and partner nations to explore the national policy and military interfaces and dynamics involved in collaborative coalition and alliance missile defense planning. Meeting this intent is necessary to develop regional defense designs, C2 relationships, and collective, bilateral, and multilateral policy. Today, ministries of foreign affairs and defense representatives from 24 nations, the North Atlantic Treaty Organization (NATO), and three additional multinational organizations, as well as the Department of State, OSD, Joint Staff, CCMDs, and MDA convene to exchange views and insights and collectively explore policy and operational concepts. The current Nimble Titan 20 campaign incorporates recent guidance from senior leaders and lessons learned to experiment with the future use of space sensors for missile defense, advanced weapon systems, deterrence, de-escalation, and non-kinetic effects as part of IAMD. Implementing a hybrid framework for virtual and in-person during the COVID-19 pandemic, the

"USSTRATCOM's NIMBLE TITAN wargame...continues to advance multinational collaboration and operational integration efforts aimed at enhancing deterrence and defense concepts against potential attack."

- USSTRATCOM SASC Posture Statement
April 2021

campaign continues to address the challenges of intelligence and information sharing in a multinational coalition as well as some of the operational considerations involved in integration and countering specific threats such as cruise missiles and unmanned aerial systems. The campaign also added a “peer excursion” element in 2019 to explore how national perspectives would change with the introduction of a major peer-level state in a conceptual “what-if” construct. Nimble Titan continues to be a gateway for the U.S. to establish crucial relationships with allies and partners. It also informs the missile defense policies of the participating nations and international organizations. Nimble Titan events foster greater confidence in combined missile defenses and provide a means to advance U.S. efforts in collaboration, integration, interoperability, and burden sharing with our allies and partners.

JFCC IMD, in coordination with CCMDs and selected allied and partner militaries, is developing a multilateral information sharing and modeling and simulation construct to enable collaborative planning and provide a better assessment of allied and partner nations’ missile defense systems and capabilities. It also participates in regular multilateral tabletop exercises and events to help partner nations identify and close capability gaps. Additionally, we have successfully integrated allies directly into the JFCC IMD staff through the Foreign Liaison Officer (FLO) Program. Our current FLOs include a German Air Force and a Danish Army officer. Both have been integrated into Nimble Titan, NATO ballistic missile defense training, and allied and partner modeling and simulation efforts resulting in an increased understanding of multinational missile defense policy, capabilities, and planning initiatives in the European region.

Joint Missile Defense Training and Education: Even with COVID-19 creating obstacles during the past year, in coordination with USSTRATCOM, the Joint Staff, CCMDs, and the Services, we continue to develop comprehensive and innovative training programs to close gaps between Service, joint, and regional missile defense training and education. In 2018, OSD designated JFCC IMD’s Joint Ballistic Missile Defense Training and Education Center (JBTEC) as the first Joint Center of Excellence. The JBTEC now offers 16 mission-oriented resident, online, and mobile training team courses to include orientation, asset management, C2BMC situational awareness, and general officer/flag officer seminar training. In 2020, JFCC IMD instructors executed

162 courses, training over 8,000 students worldwide. The significant increase in the number of students trained over past years was a result of the rise of students using online training during the COVID-19 pandemic. Additionally, JFCC IMD provided training courses to our allies and partners through military-to-military and Foreign Military Sales training venues. Earlier this year, our instructors conducted a four day Joint IAMD course for Sweden's Headquarters Military Staff. In 2019, we provided training to the Japan Self Defense Force Joint Staff, the Republic of Korea Armed Forces, and the United Arab Emirates. We anticipate additional foreign training as COVID-19 restrictions are rescinded in allied countries.

Warfighter Support and Advocacy: We need to continue streamlining and speeding MDA's efforts to provide capabilities to our warfighters as quickly as possible to meet accelerated threat developments. JFCC IMD collaborates with the CCDRs, MDA, and Services as well as their respective test agencies to leverage emerging technology to enhance existing systems, explore innovative operational concepts, and prioritize maturing technological advancements with the most promising near-term potential. To that end, we continue to optimize the collaboration inherent in the Warfighter Involvement Process to advocate for required missile defense capabilities and performance enhancements on behalf of the warfighter. Sustaining our competitive advantage through innovation and expedience depends on well-resourced and operationally relevant test campaigns as well as high fidelity modeling and simulation infrastructure and forward looking wargaming to challenge our assumptions regarding our future missile defense readiness and posture. In testing over the past year, JFCC IMD supported the first Aegis SM-3 Block IIA remote engagement of an ICBM-class target utilizing forward-based sensors; an interoperability test of THAAD and PATRIOT where a PATRIOT MSE interceptor successfully intercepted the target with data provided by THAAD, and several data collections of hypersonic vehicle flight tests to characterize sensor performance.

Offense-Defense Integration: An optimal missile defense requires an offensive capability. By retaining a capability to attack the adversary's ability to launch missiles in addition to a capability to destroy them after launch, JFCC IMD can lower the overall cost of missile defense and reduce the risks of failure. The 2019 Missile Defense Review highlighted this and directed that our future missile defense integrates offense-defense capabilities in a comprehensive posture. Creating a comprehensive approach will require balancing a variety of offensive approaches within our deterrence calculus.

"Strategic deterrence is the foundation of our national defense policy..."

- USSTRATCOM SASC Posture Statement
April 2021

Methods that could be used to attack the adversary's ability to launch include kinetic attack, cyber, the electromagnetic spectrum, or DE. Each provides opportunities to reduce the burden on active defense; however, there is no "silver bullet" to defeating the threat. As we continue to

develop increased range and lethality in our precision strike capability, we need to consider how this fits within our deterrence calculus, how we should organize to operationalize the capability, and its contribution to missile defense. Our future offensive materiel solutions to address the adversary's strike capabilities will likely be a mix of guns, missiles, electronic warfare, cyber, space, and DE. To this end, we must understand how they complement each other and strive for a balance that includes left-of-launch and offense-defense integration capabilities.

In summary, JFCC IMD continues to expand our Nation's global missile defense architecture and explores future capabilities to maintain operational advantage against current and future threats. Our competitive edge is maintained through integrated planning and operational support, deliberate investments in our capability developments by MDA and the Services, investments in our warfighters through education and training, expansion of collaboration with our allies and partners, and the speed of innovation and fielding to get capability in the hands of our warfighters.

Conclusion

Chairman Cooper and Ranking Member Turner, as members of the joint missile defense community, the Army and USSTRATCOM continue to pursue enhancements to the Nation's IAMD systems, from the tactical to the strategic levels of warfare. As outlined here, USASMD and JFCC IMD perform a broad set of critical national security missions. These missions include providing professional warfighters and capabilities to support current operations, ensuring they are prepared for tomorrow's fight, and developing new technologies required to maintain a technological advantage against our adversaries. Our trained and ready Soldiers, operating GMD elements in Colorado, Alaska, New York, California, and from remote, globally deployed locations, remain on point to defend the homeland against an ICBM attack. As a force provider to the CCDRs, we provide essential regional sensor capabilities, ballistic missile early warning, and space-enabled communications. Our regional forces continue to leverage allied collaboration and planning efforts in developing integrated and interoperable defenses against the various threat sets. USSTRATCOM, through JFCC IMD, continues to integrate missile defense system capabilities to counter global missile threats and to protect our Nation, deployed forces, allies, and partners.

While operational, doctrinal, and materiel developments are essential, our most important assets are the thousands of Soldiers, Sailors, Airmen, Marines, Guardians, Civilians, and Contractors who deploy and operate our IAMD systems. As recognized by Department leadership, the strength behind our outstanding workforce is their Families. Their contributions and sacrifices are foundational to the dedication and performance of our workforce—the role and support of our Families empowers mission accomplishment.

I appreciate having the opportunity to address missile defense matters and look forward to addressing your questions.

LTG Daniel Karbler
Commanding General, USASMDC

Lieutenant General Daniel L. Karbler assumed command of the U.S. Army Space and Missile Defense Command and Joint Functional Component Command for Integrated Missile Defense on Dec. 6, 2019.

LTG Karbler most recently served as the chief of staff, U.S. Strategic Command, Offutt Air Force Base, Nebraska. He was the principal adviser to the USSTRATCOM commander and deputy commander, and directed the activities of the command staff by developing and implementing policies and procedures in support of the command's missions. He chaired numerous boards, oversaw the command's corporate process and served as the director of the commander's staff.

LTG Karbler also served as the commanding general of the U.S. Army Test and Evaluation Command. Prior to that, he served as the director, Joint and Integration, Army G-8 at the Pentagon.

LTG Karbler has held multiple leadership positions, from platoon leader to installation chief of staff and school commandant. He has commanded both B Battery and D Battery in the 5th Battalion, 7th Air Defense Artillery Regiment, 32nd Army Air and Missile Defense Command while assigned to U.S. Army Europe. He also commanded 3rd Battalion, 43rd Air Defense Artillery Regiment, 32nd AAMDC at Fort Bliss, Texas; the 31st Air Defense Artillery Brigade, 32nd AAMDC at Fort Sill, Oklahoma; and the 94th AAMDC at Fort Shafter, Hawaii.

LTG Karbler earned his Bachelor of Science in 1987 from the United States Military Academy at West Point where he was commissioned as a second lieutenant in the Air Defense Artillery branch. He also holds a Master of Business Arts from Benedictine College in Atchison, Kansas, and a Master of Arts in strategic studies from the National War College. His military education includes the Air Defense Artillery Officer Basic and Advanced Courses, the Command and General Staff College and the National War College.

His awards include the Distinguished Service Medal, Defense Superior Service Medal, Legion of Merit, Bronze Star, Defense Meritorious Service Medal, and the Israeli Air Force Combat Operations Badge.

December 2019

UNITED STATES SPACE COMMAND

PRESENTATION TO THE
SUBCOMMITTEE ON STRATEGIC FORCES
HOUSE ARMED SERVICES COMMITTEE
U.S. HOUSE OF REPRESENTATIVES

SUBJECT: United States Space Command's Role as the Global Sensor Manager

STATEMENT OF: Lieutenant General John E. Shaw
Deputy Commander, United States Space Command

June 15, 2021

Introduction

Chairman Cooper, Ranking Member Turner, and distinguished members of the House Armed Services Committee's Subcommittee on Strategic Forces, thank you for the opportunity to represent United States Space Command (USSPACECOM) on the topic of our assigned task as Global Sensor Manager and the relationship between our efforts in that task, and missile warning for missile defense of the United States and our allies.

The President assigned USSPACECOM the specific responsibility to serve as the Global Sensor Manager. As the Global Sensor Manager, USSPACECOM is key to the planning and coordination efforts of sensors across combatant commands, U.S. Government Agencies, and our partner nations. USSPACECOM is uniquely suited to maximize the employment of multi-role capable sensors on a global and exo-global scale, contributing to our understanding and awareness of threats to our interests in space while also supporting missile warning and missile defense missions. Although United States Strategic Command (USSTRATCOM) retains the responsibility for global missile defense, global sensor management is a critical enabling function for responding to today's increasingly complex and pervasive threat environment.

Environment

The U.S. faces diverse threats around the world, and a critical component of countering these threats is understanding our adversaries. That is why the Commander of USSPACECOM, GEN James Dickinson's number one priority for the Command is Understanding our Competition. This includes expanding our Space Domain Awareness capabilities—which allow the Command to identify, characterize, and attribute threats—through an array of sensors that provide Space Domain Awareness, while also contributing to missile warning and missile defense.

Our adversaries are expanding their inventories of advanced missiles that can threaten both the U.S. homeland and our interests around the globe. Hypersonic glide vehicles and hypersonic cruise missiles pose diverse threats that complicate targeting and tracking. China is once again the pacing threat, and they are rapidly expanding their missile capabilities, emphasizing hypersonic glide vehicles, hypersonic cruise missiles, and maneuvering reentry vehicles to counter missile defense systems. Russia's large strategic arsenal and continued upgrades of its ballistic and cruise missiles alongside their nuclear weapons also pose a significant strategic threat designed to stress our sensors. Finally, rogue actors like North Korea and Iran also continue to expand their missile capabilities, developing ballistic and cruise missiles to threaten the U.S., our allies, and partners.

This environment demands integrated missile warning and missile defense solutions. The complexity of the threat we face means that we can no longer think in terms of "a linear kill chain," where one sensor identifies a threat and relays it for prosecution to a single weapon system. Rather, we must face our challenges with "kill webs," where a multitude of sensors around the world and on orbit can identify a target and pass it through integrated command and control systems for engagement by the best-suited weapon system. These sensors may be theater sensors or strategic sensors, and their seamless integration is where USSPACECOM's role as Global Sensor Manager enables flexibility and rapid decision making for missile warning and missile defense.

USSPACECOM's Role as Global Sensor Manager

As Chairman Reed of the Senate Armed Services Committee stated during GEN Dickinson's posture hearing in April, USSPACECOM is essentially the Department of Defense's "sensor command." USSPACECOM's role as the Global Sensor Manager requires that we

support all Combatant Commands (CCMDs), international partners, the National Military Command System, and key national leaders with missile warning, missile defense, and Space Domain Awareness information 24 hours a day, 365 days a year. It also requires us to coordinate with other CCMDs and U.S. Government Departments and Agencies for support from their assigned sensors for our collective warning, space and missile defense objectives.

USSPACECOM's Symbiotic Contribution to Missile Defense and Space Domain Awareness

USSPACECOM's global sensor management contributes significantly to the missile warning and missile defense missions. These sensors, often categorized as either Space Domain Awareness or missile warning and missile defense are built to perform multiple missions, and therefore many traditional missile warning and missile defense sensors can also contribute to USSPACECOM's Space Domain Awareness mission and vice versa. For example, in our role as the Global Sensor Manager and in partnership with other CCMDs and the Missile Defense Agency (MDA), we demonstrated how regional missile defense sensors can and should be used for more than one function. Traditional missile defense sensors are now augmenting missile warning sensor coverage and have proven their value in support of detecting and tracking threats entering and transiting the space domain. While we leverage both terrestrial and space-based systems to provide missile warning, missile defense, and Space Domain Awareness, we do not take control of missiles or shooters.

In our contribution to missile defense, USSPACECOM's sensors like the Space-Based Infrared System (SBIRS) and Defense Support Program satellites provide the first alert of a missile launch from anywhere on the planet to all CCMDs, international partners, the National Military Command System, and national leaders. That initial alert tips and cues USSPACECOM

and other CCMDs' sensors through theater and homeland defense communications architectures. Those communication architectures connect USSPACECOM's space-based warning segment to the Department's terrestrial warning and defense sensors for the purposes of theater and homeland ballistic missile defense. USSPACECOM is also assigned the six Upgraded Early Warning Radars that are essential to strategic warning and homeland missile defense requirements.

Additionally, USSPACECOM is actively working with other CCMDs, Agencies, and air and missile defense sensor manager experts to leverage existing sensors to contribute to the Space Domain Awareness mission. AN/TPY-2, Sea-Based X-Band Radar, and Aegis operators demonstrated the operational and technical capability to support our collective understanding of events and activities in the space domain in both exercise and real-world operations. In coordination with other CCMDs and Agency partners, we are actively testing technical solutions so that no CCMD's sensor support to Space Domain Awareness is at the expense of its primary function; a limiting factor today that we expect to resolve for tomorrow. Additional fusion of other intelligence disciplines through our close cooperation with the Intelligence Community helps further improve our understanding of the domain and our competition.

Coordination with Other CCMDs and Agencies

USSPACECOM is in lock step with U.S. Northern Command (USNORTHCOM), USSTRATCOM, and other Agencies as we provide exquisite global sensor management capabilities. In the past year, our team broke down barriers in support of our nation's collective warning and defense interests. Admiral Charles Richard, Commander of USSTRATCOM, explained in recent testimony before the Senate Armed Services Committee that after USSPACECOM's assumption of Global Sensor Manager responsibilities, he receives better

missile warning and missile defense data and more efficient utilization of existing assets. Moreover, our integration with USNORTHCOM on missile warning and missile defense provides seamless sensor coverage in support of the homeland defense mission.

Beyond our daily coordination through real world operations, USSPACECOM also regularly participates in advanced, coalition-integrated global and regional exercises and wargames to build and test our sensor management and organization. Exercises like GLOBAL LIGHTNING, AUSTERE CHALLENGE, and PACIFIC FURY provide opportunities to apply our sensors and train our crews in a complex environment, while also preparing the Joint Force, allies, and partners. USSPACECOM is also preparing to execute our own tier one multi-combatant command exercise in fiscal year 2022.

Today's Sensor Architecture and Building Future Capabilities

The significance of the confluence of Global Sensor Manager responsibilities with missile warning and missile defense will also help us advocate for an integrated and efficient solution that modernizes and recapitalizes our aging sensor architecture. We face a continuing challenge of keeping pace with evolving threats and technologies while ensuring our sensor architecture components, such as ground-based radars and SBIRS, remain optimized and modernized with key technical software and hardware upgrades. However, it is important to note that the marginal benefit between sustained modernization efforts and a new architecture concept are diminishing. The challenge of sustaining and upgrading 20th century sensors with various aging parts, now obsolete and increasingly hard to obtain, remains a difficult one. The existing portfolio of aging terrestrial and space-based sensors is not only driving us to pursue fielding new capabilities in the future, it also requires us to leverage and integrate legacy sensors in support of critical warning and active defense functions right now. This is consistent with the Secretary of

Defense's 2020 Defense Space Strategy's strategic approach, which requires that we enhance existing capabilities in order to gain and maintain strategic and operational advantages.

Research and development efforts such as continued funding of next-generation space and terrestrial sensor systems are key to ensuring we keep pace with evolving adversary threats across all domains. Space systems provide valuable solutions to layered tracking and discrimination capability. A space tracking and discrimination constellation combined with next-generation Overhead Persistent Infrared systems would provide significant improvements necessary to detect advanced threats. Future space-based sensors must be able to detect, track, and discriminate hypersonic glide vehicles and ballistic missile threats globally. We cannot fully achieve these abilities solely with terrestrial-based radars due to the constraints of geography and characteristics of future missile threats, so a space sensor layer integrated with a web of terrestrial sensors is critical to discriminating advanced and evolving threats.

Whether future systems exist in the orbital or terrestrial regime, they must possess multiple mission or mission area capabilities and joint interoperability. Space-based and terrestrial sensors must be capable of supporting the Space Domain Awareness, missile defense, and missile warning missions simultaneously from the endo-atmosphere out to cislunar space and beyond to the maximum extent practicable. Their disparate data must be fusible and displayable to allow decision makers to act on the best available and relevant information. Only through achieving this goal can we expect to maintain our edge throughout the spectrum of competition to conflict.

Additionally, USSPACECOM strongly endorses continuing work on systems such as the Long Range Discrimination Radar, the Space Development Agency's Tracking Layer Satellites, and the MDA's Hypersonic and Ballistic Missile Tracking Space Sensor. We also continue to

work with MDA in leveraging the existing capability of the Command Control, Battle Management, and Communications system in support of the Space Domain Awareness mission, integrating Space Surveillance Network sensors and greatly enhancing our battlespace awareness. This multi-mission system provides the Command greater flexibility as Global Sensor Manager, and is critical in integrating the missile warning, missile defense, and Space Domain Awareness missions.

Conclusion

USSPACECOM's outstanding Soldiers, Sailors, Marines, Airmen, Guardians, civilians, and contractors work every day to integrate within the Department of Defense as the Global Sensor Manager. We provide unmatched support to missile warning and missile defense through the optimization of existing sensors, and we appreciate Congress's support as we develop the next generation of advanced terrestrial and on-orbit capabilities. USSPACECOM also advances the use of traditional missile warning and missile defense sensors for Space Domain Awareness, which facilitates the Command's protect and defend mission in space, and provides additional capability in countering advanced missile threats. Under the direction of the President and Secretary of Defense, and with the support of Congress, USSPACECOM is prepared to provide global sensor management in support of missile warning, missile defense, and Space Domain Awareness to ensure that there is never a day without space.

Lieutenant General John E. Shaw

Lt. Gen. John E. Shaw is the Deputy Commander, U.S. Space Command. U.S. Space Command is the 11th and most recently established Unified Combatant Command responsible for conducting operations in, from and to space to deter conflict, and if necessary, defeat aggression, deliver space combat power for the Joint/Combined force, and defend U.S. vital interests with allies and partners.

Lt. Gen. Shaw entered the Air Force in 1990 as a distinguished graduate of the U.S. Air Force Academy with a degree in astronautical engineering and a minor in Russian language. He has served in a variety of air and space operations and staff positions, including operations tours in the 50th Space Wing, the National Reconnaissance Office, the 32nd Air Operations Group and the Space Warfare Center. His operational commands have included the 4th Space Operations Squadron, the 50th Operations Group and the 21st Space Wing. He also served at U.S. Strategic Command as Director of the Commander's Action Group and as Deputy Director for Operations, and in the Pentagon as an Air Force intern, as Deputy Chief of Space Strategy and Integration, a speechwriter and as a senior space policy advisor.

Prior to his current position, Lt. Gen. Shaw was dual hatted as the Commander, Combined Forces Space Component Command, U.S. Space Command, and Deputy Commander, Space Operations Command, U.S. Space Force, Vandenberg Air Force Base, California. He also served as the Deputy Commander of Air Force Space Command, United States Air Force.

EDUCATION

1990 Bachelor of Science, Astronautical Engineering, minor, Russian Language, U.S. Air Force Academy, Colorado Springs, Colo.

1991 Master of Science, Aeronautics and Astronautics, University of Washington, Seattle

1995 Squadron Officer School, Maxwell Air Force Base, Ala.

1998 Master of Arts, Organizational Management, The George Washington University, Washington, D.C.

2004 Master of Arts, Military Operational Arts and Sciences, Air Command and Staff College, Maxwell AFB, Ala.

2008 Master of Science, National Security Strategy, National War College, Fort Lesley J. McNair, Washington, D.C.

2010 Senior Executive Fellow, Harvard Kennedy School, Cambridge, Mass.

ASSIGNMENTS

August 1990–August 1991, Student, University of Washington, Seattle

September 1991–September 1994, Deputy Crew Commander and Spacecraft Systems Engineer, 1st Space Operations Squadron, Falcon Air Force Base, Colo.

October 1994–July 1996, Flight Commander and Chief of Mission Analysis, Mission Control Complex IX, Operating Division 4, Onizuka Air Station, Calif.

August 1996–May 1998, Air Force Intern, Office of the Deputy Under Secretary of Defense for Space, and Office of the Assistant Secretary of the Air Force for Acquisition, the Pentagon, Arlington, Va.

June 1998–December 1999, Chief, Special Information Warfare Plans, 32nd Air Operations Group, Headquarters U.S. Air Forces in Europe, Ramstein Air Base, Germany

April 1999–June 1999 (Deployed), Chief, Special Technical Operations, Joint Task Force Noble Anvil, Operation Allied Force, Headquarters NATO Armed Forces South, Naples

January 2000–March 2001, Executive Officer, Director of Aerospace Operations, Headquarters U.S. Air Forces in Europe, Ramstein AB, Germany

April 2001–March 2002, Deputy Chief, Strategy Branch, Directorate for Space Operations and Integration, Headquarters Air Force, the Pentagon, Arlington, Va.

April 2002–July 2003, Speechwriter, Secretary of the Air Force & Chief of Staff of the Air Force Executive Action Group, Headquarters Air Force, the Pentagon, Arlington, Va.

August 2003–May 2004, Student, Air Command and Staff College, Maxwell AFB, Ala.

June 2004–May 2005, Operations Officer, 25th Space Control Tactics Squadron, Space Warfare Center, Schriever AFB, Colo.

June 2005–June 2007, Commander, 4th Space Operations Squadron, Schriever AFB, Colo.
 July 2007–June 2008, Student, National War College, Fort Lesley J. McNair, Washington, D.C.
 July 2008–June 2010, Director, Commander's Action Group, U.S. Strategic Command, Offutt AFB, Neb.
 July 2010–July 2012, Commander, 50th Operations Group, Schriever AFB, Colo.
 August 2012–July 2013, Senior Policy Advisor, Office of the Deputy Assistant Secretary of Defense (Space Policy); Office of the Under Secretary of Defense for Policy, the Pentagon, Arlington, Va.
 July 2013–June 2015, Commander, 21st Space Wing, Peterson AFB, Colo.
 June 2015–June 2017, Deputy Director, Global Operations Directorate, U.S. Strategic Command, Offutt AFB, Neb.
 June 2017–August 2018, Director of Strategic Plans, Programs, Requirements and Analysis, Headquarters Air Force Space Command, Peterson AFB, Colo.
 August 2018–November 2019, Deputy Commander, Air Force Space Command, Peterson AFB, Colo.
 November 2019–December 2019, Commander, Combined Force Space Component Command, U.S. Space Command; and Commander, 14th Air Force, Air Force Space Command, Vandenberg AFB, Calif.
 December 2019–October 2020, Commander, Combined Force Space Component Command, U.S. Space Command, and Commander, Space Operations Command, U.S. Space Force, Vandenberg AFB, Calif.
 October 2020–November 2020, Commander, Combined Force Space Component Command, U.S. Space Command, and Deputy Commander, Space Operations Command, U.S. Space Force, Vandenberg AFB, Calif.
 November 2020–present, Deputy Commander, U.S. Space Command, Peterson AFB, Colo.

SUMMARY OF JOINT ASSIGNMENTS

April 1999–June 1999 (Deployed), Chief, Special Technical Operations, Joint Task Force Noble Anvil, Operation Allied Force, Headquarters NATO Armed Forces South, Naples, as a captain
 July 2008–June 2010, Director, Commander's Action Group, U.S. Strategic Command, Offutt Air Force Base, Neb., as a colonel
 August 2012–July 2013, Senior Policy Advisor, Office of the Deputy Assistant Secretary of Defense (Space Policy); Office of the Under Secretary of Defense for Policy, the Pentagon, Arlington, Va., as a colonel
 June 2015–June 2017, Deputy Director, Global Operations Directorate, U.S. Strategic Command, Offutt AFB, Neb., as a brigadier general
 November 2019–November 2020, Commander, Combined Force Space Component Command, U.S. Space Command, Vandenberg AFB, Calif., as a major general
 November 2020–present, Deputy Commander, U. S. Space Command, Peterson AFB, Colo., as a lieutenant general

MAJOR AWARDS AND DECORATIONS

Distinguished Service Medal
 Defense Superior Service Medal with oak leaf cluster
 Legion of Merit with oak leaf cluster
 Kosovo Campaign Ribbon with campaign service star

OTHER ACHIEVEMENTS

General Jerome O'Malley Distinguished Space Leadership Award
 Associate Fellow, American Institute of Aeronautics and Astronautics
 National Reconnaissance Office Gold Medal
 National Finalist, White House Fellow Program
 Royal Air Force Historical Society and U.S. Air Force Historical Foundation "Two Air Forces" Award for Writing (1998)

SELECTED PUBLICATIONS

"Guarding the High Ocean: Towards a New National-Security Space Strategy through an Analysis of U.S. Maritime Strategy," Air & Space Power Journal (Maxwell Air Force Base, Ala., Spring 2009)
 "On Cossacks, Subs, and SAMs: Defeating Challenges to U.S. Space Superiority," High Frontier Journal (Peterson AFB, Colo., Winter 2005)
 Whither Space Power? Forging a Strategy for the New Century, with Brig. Gen. Simon P. Worden; (Monograph, Maxwell AFB, Ala.: Air University Press, 2002)
 "The Influence of Space Power Upon History: 1944-1998," Air Power History Journal (Lexington, Va.: Air Force Historical Foundation, Winter 1999)

Optimal Control Designs for an Inverted Cart-Pendulum Array, Formal Thesis; University of Washington, Seattle, 1991

EFFECTIVE DATES OF PROMOTION

Second Lieutenant May 30, 1990

First Lieutenant May 30, 1992

Captain May 30, 1994

Major May 1, 2001

Lieutenant Colonel May 1, 2005

Colonel Oct. 1, 2008

Brigadier General June 5, 2015

Major General Aug. 17, 2018

Lieutenant General Nov. 23, 2020

(Current as of December 2020)

**WITNESS RESPONSES TO QUESTIONS ASKED DURING
THE HEARING**

JUNE 15, 2021

RESPONSE TO QUESTION SUBMITTED BY MR. WALTZ

Ms. TOMERO. The Department of Defense remains committed to working with Israel to ensure that the Iron Dome Defense System is capable of protecting Israeli civilians. The Department supports Israel's request for additional support for its Iron Dome Defense System. The Department of Defense has provided Congress with information in support of Israel's request, and stands ready to answer any questions, as needed. The Department also continues to consult closely with the Israeli Ministry of Defense on Israel's security needs. [See page 28.]

QUESTIONS SUBMITTED BY MEMBERS POST HEARING

JUNE 15, 2021

QUESTIONS SUBMITTED BY MR. LANGEVIN

Mr. LANGEVIN. General VanHerck, in your written testimony you mentioned that we need to review electromagnetic spectrum management policies. Can you elaborate on that?

General VANHERCK. Some of the most promising technologies for the denial and defeat of current and future competitor weapon systems utilize electronic attack. I believe installations in the United States need access to the full range of electromagnetic capabilities used for force protection at bases overseas, to enable an agile and effective response to evolving threats. However, use of these technologies in a homeland defense application will require careful consideration of collateral effects and a review of policies that govern our domestic electronic spectrum.

Mr. LANGEVIN. The decision to cut the MDA's directed energy program also cut the diode pumped alkaline laser project. This is especially frustrating since the program plans to transition the technology to industry next year. Given the lack of action at the OSD level on moving forward, how are you working with OSD leadership to ensure that recent progress leads to an industry transition next year?

Admiral HILL. In collaboration with Office of the Under Secretary of Defense Research and Engineering (OUSD(R&E)), the Missile Defense Agency (MDA) used the FY 2021 Congressional Program Increase for the Diode Pumped Alkali Laser (DPAL) to continue DPAL laboratory development with Lawrence Livermore National Laboratory (LLNL) and engage industry (General Atomics, Boeing, Northrop Grumman, Lockheed Martin, and Raytheon). Using the current Congressional funding, DPAL will meet the 100kW-class goal with good beam quality in the 3rd quarter of FY 2022. At the 100 kW-class goal, DPAL is eligible for the OUSD(R&E) High Energy Laser Scaling Initiative (HELSEI) funding for development to the 300 & 500kW-class. While MDA and R&E identified additional development needs, there is no additional R&E funding for DPAL because HELSEI currently funds four 100kW-class lasers to the 300kW-class level and anticipates funding one or more to the 500kW-class level in FY 2023. MDA and R&E have collaborated to monitor DPAL progress and develop the next steps. Our plan keeps industry engaged while MDA, the Independent Assessment Team, and the Air Force Research Lab develop a risk reduction approach that includes developing an independent laser kinetics model. The cost of technology transition is expected to be reduced once the model is developed and the 100kW milestone is reached, however, further development is unfunded by industry, MDA or R&E. By FY 2023, R&E will have more knowledge of the progress of the HELSEI vendors. Until then, R&E and MDA recommend continuing DPAL.

Mr. LANGEVIN. Your unfunded priority list includes cybersecurity efforts across a couple programs. What are the consequences of not funding those efforts?

Admiral HILL. Please see the table and description below:

Enabling PE 0603890C (MC30)—\$25.3 million (M)

Program Element/Budget Project	Effort	FY22 RTC UFR (\$M)
0603890C/MC30	User Activity Monitoring (UAM) for Missile Defense System (MDS) Operations	12.0
	Compliance Mandates, Tech refresh - end of life (EoL), Data Center Recap, Hardware/Software (HW/SW) Refresh, Insider Threat Protection, and Software Assurance posture	5.0
	MDA Integration and Operations Center (MDIOC) Infrastructure	3.5
	Data Center Recapitalization - Preposition power & network connectivity	2.5
	Unclassified Virtual Desktop Infrastructure (VDI)	2.1
	Cyber Assistance Team Threat Hunting	0.2
	Total	25.3

\$12.0M: User Activity Monitoring—Funds provide the implementation of the Forcepoint modules on the Missile Defense System Research, Development, Test and Evaluation (RDT&E) classified enclaves to achieve compliance with Executive Order EO13587, National Insider Threat Task Force minimum standards for user activity monitoring. The impact of not funding this effort is the Missile Defense Agency (MDA) will be unable to effectively detect insider threats across critical Missile Defense System (MDS) cyber terrain, and provide relevant data for user behavior in support of authorized investigations. As established in the Executive Order, MDA implemented an insider threat detection and prevention program consistent with guidance and standards developed by the Insider Threat Task Force.

\$5.0M: Compliance Mandates—Funds provide the ability to mitigate system vulnerabilities in the areas of technical refresh, software updates, secure and standardized software development processes, and rogue system detection/data loss prevention, which strengthens MDA's cyber defenses and enables its ability to meet mission requirements. Cyberspace is a global enabler for information exchange affecting all aspects of life. Network-connected systems makes it easier for malicious cyber actors to access critical MDS information and disrupt vital operations from anywhere across the globe. The impact of not funding these efforts weakens MDA's defenses against possible cyber-attacks, and prevents MDA from remaining compliant with Department of Defense (DOD) Chief Information Office (CIO) and United States Cyber Command mandates such as Zero Trust, Comply to Connect, and Four Lines of Effort. In addition, MDA would delay implementing the infrastructure required to support Zero Trust in the current telework environment.

\$3.5M: MDA Integration and Operations Center (MDIOC) Infrastructure—Funds provide the implementation of a Special Use Space (SUS) data center (DC) in support of an evolving need to execute MDS activities at the Top Secret Level. SUS DC supports programs and information at the Top Secret (TS) collateral classification level that is not available today. Currently, MDA has limited special processing space to execute the TS mission. The consequence of not funding this effort will severely limit the programs' ability to access TS networks, to have sufficient storage for data classified at the TS collateral level, and to support cyber operations.

\$2.5M: Data Center Recapitalization—Funds provide additional data server space and power distribution to support the expanding need for cloud services and rapid deployment of new capability supporting the MDS. The consequence of not funding this effort will negatively impact MDA's ability to rapidly support cloud-centered programs such as Next Generation Interceptor, Hypersonic Ballistic Tracking Space Sensor, and Model-based System Engineering.

\$2.1M: Virtual Desktop Infrastructure (VDI)—Funds provide unclassified Virtual Desktop Infrastructure accessible by the MDA teleworker and other remote stakeholder access to MDA RDT&E unclassified environments. VDI would further support the telework environment and provide remote access and a standardized desktop that is cybersecurity compliant and supports data loss prevention by retaining all MDA information in the MDA/DOD data center environment. System administrators apply software patches and updates to all virtual desktops across the MDA enterprise within the server environment. If funding is not available for this effort, management of the operating system and associated applications makes it difficult to properly and securely manage approximately 10,000 individual laptops used to support the telework environment. MDA is distributing computing for modeling and simulation and model-based system engineering to the Defense Industrial Base (DIB) partners where VDI adds additional information protection through centralized hosting of data in government data centers. Use of VDI is expected to avoid costs in excess of \$23M to refresh the unclassified laptop fleet and to provide individual clients to the DIB partners.

\$2M: Cyber Assistance Team (CAT) Threat Hunting—Funds provide Agency CIO office services to the Technical Intelligence Directorate and ensures technical and systems administration support for Cyber Threat Hunting systems, tools, users and capabilities. Not funding this effort would eliminate or reduce the Agency's ability to support numerous internal deployable Cyber Threat Hunt teams on active threat hunt missions with the objective of detecting and thwarting ongoing or future cybersecurity threats to MDA and DIB partners' data. It would also reduce the Agency's ability to centrally host, manage, and analyze technical data and information relevant to the threat hunting mission, and identify DIB preliminary indicators of compromise.

Enabling PE 0603890C (MC31)—\$19.5M

Funds provide MDA the ability to conduct warfighter-engaged cyber table-top events (Cyber VISUM) to support cyber-risk assessments of the MDS in an operational scenario. This funding provides dedicated cyber engineering capability to "design in" cyber resiliency, survivability, and defensibility, and to verify the de-

sign's cyber effectiveness through developmental and operational test and assessment. MDA would also be able to centrally conduct independent software stress testing to improve security, resiliency, and reliability of MDS software under development. These capabilities will reduce opportunities, likelihood, impact, and severity of cyber threat risk to the MDS. Without the additional funding, MDA will be reactive to the cyber threat and will remain vulnerable to a potential cyber threat risk to the MDS.

Advance Concepts and Performance Assessment PE 0603176C (MC71)—\$5.2M

Funds provide continued currency of computing system SW/HW for Risk Management Framework requirements. The impact of not funding these efforts reduces the ability to maintain compliance with the Department of Defense Cybersecurity Discipline Implementation Plan and Risk Management for Advanced Concepts and Performance Assessments, and resources required to replace/upgrade hardware and software infrastructure components to protect the Missile Defense Agency's information technology systems in the highly contested cybersecurity threat environment.

Ballistic Missile Defense Sensors PE 0603884C (MC11)—\$3M

Funds provide compliance testing for Army Navy/Transportable Radar Surveillance and Control Model 2 (AN/TPY-2), X-Band Radar (XBR), and Long-Range Discrimination Radar (LRDR) mission. The consequences of not receiving funding for compliance testing for AN/TPY-2, XBR, and LRDR missions creates a lack of subject matter experts (SMEs) available during and after cyber testing, and increases the risk for delayed responsiveness. Lack of funding for cybersecurity test support may limit Ground Sensors mission systems' participation in the FY 2022 cybersecurity testing campaign, including the elimination of on-site Prime Contractor SME support during and after scheduled testing. This SME support is essential for risk reduction of the mission system associated with robust cybersecurity testing as well as the post-event analysis of all findings identified during testing.

Ballistic Missile Defense Command and Control, Battle Management & Communication (C2BMC) PE 0603896C (MC01) (\$2M)

Funds provide compliance with the DOD Cybersecurity Discipline Implementation Plan. The impact of not receiving these funds is a potential two to four year delay of the C2BMC prime contractor implementation of Cybersecurity enhancements to the software development environment as well as support lab infrastructure (hardware/software) upgrades. These enhancements bolster DOD Cybersecurity Implementation Plan Lines of Effort 1 and 4, and automate the implementation, testing, and verification of cybersecurity requirements, which significantly reduces the time required to build and approve C2BMC software application development and test infrastructure, and get a secure, robust product into the hands of the war fighter rapidly. The reduction will also delay full implementation of MDA data-at-rest encryption requirements as well as implementation of current DISA Security Technical Implementation Guide (STIG) and Risk Management Framework technical requirements. Both activities, if not implemented, place risk on C2BMC to threats from hackers and other malicious actors, and delay C2BMC from meeting security and survivability requirements.

Mr. LANGEVIN. General Shaw, DHS is currently reviewing critical infrastructure sectors. In that vein, would you support designating space as a critical infrastructure sector? How would that designation improve space-based missile defense?

General SHAW. "Space-based missile defense" is a small piece of the opportunities provided by operating in, from, and to space. Some DOD, as well as other sectors', assets in Space are critical to DOD. DOD is the Sector Risk Management Agency (SRMA) for the Defense Industrial Base (DIB) Critical Infrastructure Sector. As such, many space-related DOD equities are accounted for in the DIB Sector through the DIB SRMA working by, with, and through other Sectors, and through the DOD's Mission Assurance Process. Space contributes to defense and provides vital capabilities and opportunities in several critical infrastructure sectors, including communication, financial services, information technology, and transportation systems. DHS established a Cross-Sector Council for Space, a few years ago, because working in partnership with other sectors is essential to holistic risk management efforts. DOD does not, at this time, have a specific position on the establishment of a new critical infrastructure sector for Space. The most important thing is for critical infrastructure sectors to work together on threat sharing and risk management to ensure the continuity of National Critical Functions that are dependent on Space assets.

QUESTIONS SUBMITTED BY MR. TURNER

Mr. TURNER. Does the NORTHCOM North Warning System line have capability to detect hypersonic weapons? If not, then what is being done to add or integrate this capability into our radar systems?

Ms. TOMERO. The North American Aerospace Defense Command (NORAD) North Warning System radar is not optimized for this class of missile threat and would not be able to provide complete coverage for detection of hypersonic threats. Hypersonic threats are designed to circumvent our current sensing and missile defense capabilities. The Hypersonic and Ballistic Tracking Space Sensor (HBTSS) prototype which is on track to enter orbit in late Fiscal Year (FY) 2023, is one component of the Department's National Defense Space Architecture (NDSA). The NDSA will initially consist of a few dozen satellites—a mix of commercial, Space Development Agency (SDA), and HBTSS satellites—launched into low Earth orbit (LEO) over the next two years. While this proliferated LEO architecture is in its initial stages, it will ultimately provide critical resilient tracking capability against hypersonic threats in all phases of flight. As we continue to prove this capability, the NDSA will expand and further bolster the nation's sensing capabilities and ability to protect U.S. and coalition forces deployed abroad.

Mr. TURNER. Does the NORTHCOM North Warning System line have capability to detect hypersonic weapons? If not, then what is being done to add or integrate this capability into our radar systems?

General VANHERCK. No, due to its age and technological limitations, the North American Aerospace Defense Command (NORAD) North Warning System (NWS) cannot reliably or consistently detect hypersonic weapons. Moreover, it is not possible to modify the NWS to ensure effective detection of emerging hypersonic threats.

NORAD is working with the Air Force and Canada to begin acquisition of Over the Horizon Radars capable of detecting and tracking a broad range of air vehicle, missile, and hypersonic threats to North America. To date, the Air Force has funded initial site surveys and environmental impact studies, scheduled for completion in 2022, but has yet to program for acquisition of the radars.

Mr. TURNER. Does the NORTHCOM North Warning System line have capability to detect hypersonic weapons? If not, then what is being done to add or integrate this capability into our radar systems?

Admiral HILL and General KARBLES. The NORAD North Warning System radar is not optimized for this class of missile threat and would not be able to provide complete coverage for their detection. Hypersonic threats were designed in part to circumvent our current sensing capabilities. The Hypersonic and Ballistic Tracking Space Sensor (HBTSS) which is on track to enter orbit in late Fiscal Year 2023, is one component of the Department's National Defense Space Architecture (NDSA). The NDSA will initially consist of a few dozen satellites, launched into low earth orbit (LEO) over the next two years. While this proliferated LEO architecture is in its initial stages, it will provide critical tracking capability against hypersonic threats in all phases of flight. HBTSS is unique in that it will provide fire control quality track data to the missile defense system. This will enable regional engagement of hypersonic threats. As we continue to prove this capability the architecture will expand and further bolster the nation's sensing capabilities and the defense of the United States and coalition forces deployed abroad.

Mr. TURNER. Does the NORTHCOM North Warning System line have capability to detect hypersonic weapons? If not, then what is being done to add or integrate this capability into our radar systems?

General SHAW. NORAD/USNORTHCOM is the operating agency for the North Warning System, and USSPACECOM defers to their expertise to answer this question.

QUESTIONS SUBMITTED BY MR. LAMBORN

Mr. LAMBORN. General VanHerck, you've previously testified that with regard to the current North Korean ICBM capabilities, you are comfortable with our present missile defense capabilities. However, as their ICBM capabilities continue to develop, we will be assuming greater risk starting in 2025 as the North Korean ICBM threat begins pacing and potentially out-pacing our homeland defense capabilities.

YES or NO: In your best military judgement, will the North Korean ICBM threat will begin pacing our current homeland defense capabilities in 2025 and beyond?

General VANHERCK. No. As I testified, I am comfortable with where the Department is today, and the plan to field the Next Generation Interceptor (NGI) in 2028, or sooner. However, going forward, rogue nations are developing additional capabili-

ties with the intent to hold our homeland at risk. While intelligence assessments vary on the timing and scope of North Korea's ICBM program, North Korea certainly continues to advance its ballistic missile technology. The risk of being outpaced could increase if the homeland ballistic missile defense capabilities and capacity do not continue to evolve; the timeline for NGI fielding is critical for this continued evolution.

Mr. LAMBORN. To what extent and on which programs are you coordinating with the directed energy working group that was established in the FY20 NDAA?

Admiral HILL. MDA is actively participating at the R&E level as a member of the FY 2020 National Defense Authorization Act (NDAA) Directed Energy Working Group (DEWG). The DEWG is comprised of Senior Executive Service level membership from the Navy, Army, Air Force and MDA, to coordinate directed energy efforts, leverage shared research and development, eliminate redundant efforts, and expedite the operationalization of directed energy programs. DEWG was briefed on MDA's Boeing Fiber Combined Laser and DPAL programs. MDA provides direct support for R&E's HELSI and the Probability of Weapon Effectiveness Experiment efforts with R&E funding. MDA actively participates in R&E program reviews, provides technical support and receives R&E funding for projects of joint interest.

Mr. LAMBORN. Others have previously testified in open testimony that with regards to current North Korean ICBM capabilities they are comfortable with our present missile defense capabilities to protect the homeland. However, as their ICBM capabilities continue to develop, we will be assuming greater risk starting in 2025 as the North Korean ICBM threat begins pacing and potentially out-pacing our homeland defense capabilities.

YES or NO: in your best military judgement, will the North Korean ICBM threat will begin pacing our current homeland defense capabilities in 2025 and beyond?

Admiral HILL. The Missile Defense Agency (MDA) defers to the military judgement of United States Northern Command and Defense Department leadership on the sufficiency of fielded and planned capabilities. The current Ground-based Mid-course Defense (GMD) system, consisting of space-based, maritime, and terrestrial sensors, GMD fire control, Command and Control Battle Management and Communications, supporting communications, and 44 Ground-Based Interceptors in Alaska and California provides protection for the United States against the rogue state ballistic missile threat. The DOD plans to commence the fielding of an additional twenty Next Generation Interceptors (NGI) in 2028 to improve the capacity, capability, and lethality of the GMD system and to invest in a Stockpile Life Extension Program to maintain reliability and capability of the current Exoatmospheric Kill Vehicle fleet until the NGIs are fielded. Additionally, the MDA continues to explore potential layered options for the Department's consideration to augment GMD by leveraging the capability of existing BMD systems.

Mr. LAMBORN. To what extent and on which programs are you coordinating with the directed energy working group that was established in the FY20 NDAA?

General KARBLES. Dr. Craig Robin, who heads up the Army directed energy development effort through Army RCCTO, is a member of the Directed Energy Working Group. He and the Group are specifically making sure that Army directed energy programs are well coordinated across the Services and the DOD.

QUESTIONS SUBMITTED BY MR. HORSFORD

Mr. HORSFORD. Can you describe the planned composition of the Guam Defense System if fully funded, and how it would effectively protect Guam in the face of hypersonic weapons fielding?

Ms. TOMERO. Within the Indo-Pacific region, China's growing anti-access/area denial (A2/AD) conventional missile capabilities threaten Guam, which remains a growing strategic hub for our presence in the region. The Department's ability to operate from Guam, including defenses that enable sustained operations during a conflict, will be central to implementing the U.S. Indo-Pacific strategy. Missile defense is one component of the U.S. capability to counter missile centric strategies. In this role, effective and affordable missile defense creates doubt for China and North Korea that it would be possible to quickly neutralize forward-deployed military capabilities at low cost or with low risk of escalation.

The Department is nearing completion of in-depth analysis regarding missile defense options for the defense of Guam. This study will inform how the Department will build on the requested \$118 million toward system foundational work to help pursue a strategy tailored to the threat and that is in alignment with this Administration's Policy. Hypersonic missiles are being developed, in part, to bypass U.S. missile defense capabilities. It is important to examine the means that might pro-

vide us a credible defense for Guam against emerging regional offensive systems. Initiatives are underway to provide first a point defense capability against hypersonic threats, and eventually a broader defensive architecture. These efforts will inform the missile defense of Guam architecture analysis and the broader strategy for integrated defense of island against the full spectrum of threats.

Mr. HORSFORD. In this unclassified setting, can you roughly describe the probability of kill for Aegis against a hypersonic boost glide vehicle in the terminal stage?

Admiral HILL. This requires a classified response and Missile Defense Agency (MDA) will provide a response through proper channels.

Mr. HORSFORD. Vice Admiral Hill, you also testified last week that the glide phase interceptor is being accelerated in the FY22 Presidential budget request.

Can you describe the nature of this acceleration? When do you anticipate a kill vehicle capable of interception in the glide phase will reach initial operating capability?

Admiral HILL. The MDA has changed the hypersonic defense strategy from a Science and Technology (S&T) strategy to an Aegis-based prototype strategy. This accelerated strategy is based on encouraging results from partner flight tests and missile analysis. The previous S&T strategy would deliver capability in late 2030s; the FY22 Presidential Budget request will accelerate capability delivery to early 2030s. The Agency continues to explore accelerating this critical capability into the late 2020's if appropriations allow.

